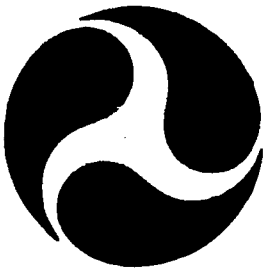

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U.S. Department of Transportation
Federal Aviation Administration
Specification

Weather Message Switching Center Replacement System Specification

Specification Change Notice (SCN)

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Weather Message Switching Center Replacement	

This notice informs recipients that the specification identified by the number (and revision letter) shown in block 4 has been changed. The pages changed by this SCN (being those furnished herewith) carry the same date as this SCN. The page numbers and dates listed below in the summary of changed pages, combined with nonlisted pages of the original issue of the revision shown in block 4, constitute the current version of this specification.

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[signature]	16 Aug 90

*"S" Indicates Supercedes Earlier Page; "A" Indicates Added Page

FAA-E-2764c

WEATHER MESSAGE SWITCHING CENTER REPLACEMENT

SYSTEM SPECIFICATION

Prepared for
U.S. Department of Transportation
Federal Aviation Administration

July 25, 1990

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1.0 SCOPE

1.1 Identification. This specification establishes the requirements for the Weather Message Switching Center Replacement (WMSCR). The WMSCR is part of the Federal Aviation Administration's (FAA) National Airspace System (NAS). The WMSCR has been promulgated by NAS-DD-1000, NAS-SS-100000; Volume II, and FAA Order 7032.3.

1.2 Purpose. The WMSCR's primary purpose is to collect and process weather data for distribution to users within the NAS. In addition, the WMSCR will collect Notices to Airmen (NOTAM) from the FSS environment for processing by the Consolidated NOTAM System Processor (CNSP) and will store and distribute the processed NOTAMs received from the CNSP. It will collect, process, and distribute weather data, along with storing and distributing NOTAMs, for users of aviation weather products. The WMSCR will replace the current Weather Message Switching Center (WMSC) system in Kansas City, Missouri. It will support all functions related to weather processing presently performed by the WMSC, plus storage and distribution of NOTAMs. In addition, it will have a graphic data distribution capability. The WMSCR will consist of two identical nodes located at the National Aviation Weather Processing Facility (NAWPF) sites in Salt Lake City, Utah and in Atlanta, Georgia; that will provide geographical redundancy and increase operational availability. Each WMSCR node will normally serve approximately half the system. If one node fails, the surviving node will assume complete system operation.

The WMSCR will be capable of continuous, 24-hours/day, 7 days per week operation. It is planned to become operational in 1990, and the system lifetime is anticipated to be at least 20 years. The WMSCR is expected to reduce maintenance and operational costs through the use of up-to-date technology, and to reduce communication costs through the use of the National Airspace Data Interchange Network (NADIN) packet switch network (PSN).

Figure 1 is a system interconnection diagram showing the principal external interfaces to the WMSCR.

Each WMSCR node will have dedicated data communication links with:

(1) The other WMSCR node.

(2) A National Weather Service Telecommunications Gateway (NWSTG).

(3) The collocated Aviation Weather Processor (AWP).

(4) Coded Time Source (CTS).

(5) The WMSCR will communicate through NADIN PSN with:

  (a) Real Time Weather Processors (RWP).

  (b) Automated Weather Observation System (AWOS) Data Acquisition System (ADAS).

  (c) Leased Service A Systems (SAS).

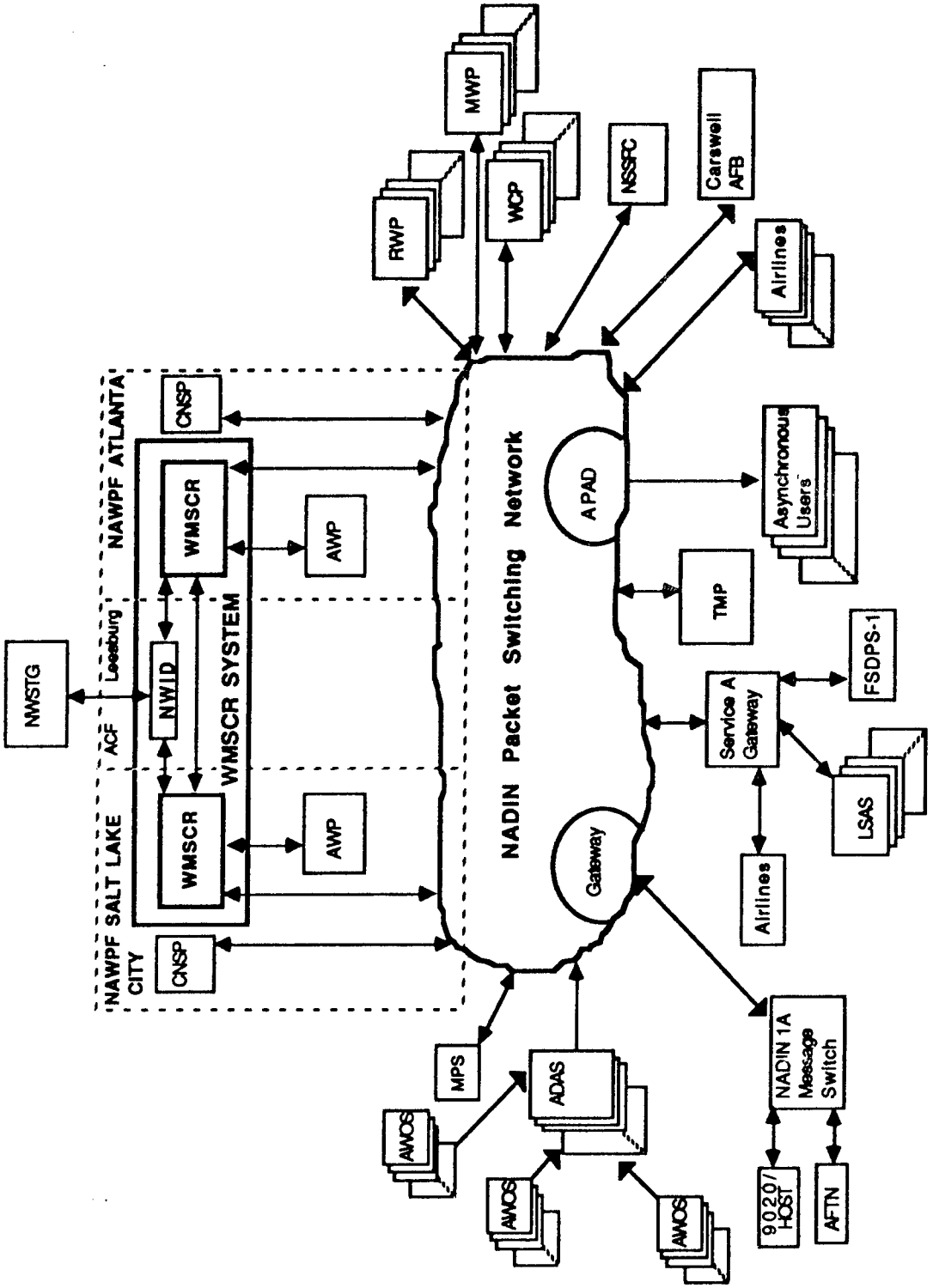

Figure 1. WMSCR System Interconnection Diagram

(d) Asynchronous PAD users.

(e) Meteorologists Weather Processors (MWP).

(f) The U.S. Department of Defense (DOD) via Carswell Air Force Base (KAWN).

(g) The National Severe Storms Forecast Center (NSSFC).

(h) The NADIN 1A Message Switch subscribers.

(i) Weather Communication Processors (WCP).

(j) The Consolidated Notam System Processor (CNSP).

(k) Maintenance Processor Subsystem (MPS).

(l) Traffic Management Processor (TMP).

(m) Commercial Vendor Users.

A repertoire of network user services has been established to provide a uniform set of procedures that will serve all current and potential NADIN packet network users. The principal flow of weather data is from the NWSTG through WMSCR, to the AWP, and packet network users. The principal message users of WMSCR are the Aeronautical Fixed Telecommunications Network (AFTN) and the 9020 replacement (ATC) computer. In addition, the flow of NOTAM data will be principally from the Flight Service Station (FSS) environment through the AWP to the CNSP via WMSCR and from CNSP to WMSCR for storage and distribution.

1.3 Introduction. This document provides functional, performance, development, test, and quality assurance requirements for the WMSCR and is arranged per DOD-STD-2167, DI-ECRS-8XXI, as follows:

Section 1 includes the identification of this document, purpose of the WMSCR, and introduction to this document.

Section 2 lists other documents applicable to WMSCR requirements to the extent described in this specification.

Section 3 contains functional, performance, interface, system characteristics, processing resources, quality factors, logistics, and precedence requirements. Among the quality factors are reliability, maintainability, availability, and quality assurance. The five major functional areas of the WMSCR are identified as:

(a) Communications.

(b) Processing.

(c) Storage and retrieval.

(d) System control.

(e) Development and testing.

This functional breakdown is not intended to imply a specific design for the WMSCR system. Further, any references to programs or data bases are to be considered conceptual and are not intended to constrain the ultimate design of the WMSCR system. Design will be the responsibility of the contractor. The communications function is organized into subfunctions, each of which corresponds to the International Standards Organization (ISO) seven-layer model for Open System Interconnection (OSI) per ISO/OSI 7498. Most connections are provided by the NADIN PSN interface. All information about the communications function that is specific to the WMSCR, such as description of the interfaces between layers of the WMSCR and WMSCR design guidelines, are included in the Interface Requirements Document (IRD) for that specific interface.

Section 4 lists WMSCR test requirements and presents a qualification cross-reference table to show how each requirement in Section 3 will be verified.

Section 5 covers preparation for delivery requirements, including packing and shipment considerations.

Section 6 contains acronym explanations and a glossary of WMSCR-related terms.

The Interface Requirements Documents for the various WMSCR external interfaces are found in separate documents as listed in 2.2.3. Each layer in the ISO/OSI model has an implied (or virtual) relationship with the same layer of the connected system. This relationship is called the peer-to-peer protocol. The information describing this protocol forms the content of the IRDs. This protocol is symmetrical and is equally valid for either system. The IRDs also describe optional user facilities supported for the establishment of permanent and switched virtual connections, network flow control, and delivery confirmation.

2.0 APPLICABLE DOCUMENTS

2.1 General. The documents listed below form a part of this specification and are applicable to the extent described in this document.

2.2 Government Documents. Only versions of the following Government documents, of the issue in effect on the date of the invitation for bids or request for proposals, apply to this specification.

2.2.1 Specifications.

2.2.1.1 Federal specifications.

FAA-G-2100 Electronics Equipment, General Requirements

FAA-E-2770 NADIN PSN Functional Specifications

FAA-E-2683 Specification for the Flight Service Automation System

2.2.1.2 Military specifications.

MIL-E-17555 Preparation for Delivery of Electronic and Electronic Equipment and Associated Repair Parts

2.2.2 Standards.

2.2.2.1 Federal standards.

FAA-STD-013 Quality Control Program Requirements

FAA-STD-018 Computer Software Quality Program Requirements

FAA-STD-020 Transient Protection, Grounding, Bonding, and Shielding for Equipment

FAA-STD-021 Configuration Management

FAA-STD-028 Contract Training Program

FCC Rules and Regulations, Part 15, Subpart J

FIPS PUB 71 Advanced Data Communication Control Procedures (ADCCP)

FIPS PUB 78 Guideline for Implementing ADCCP

OSHA-CFR-29 CFR 1910 OSHA Safety and Health Standards

2.2.2.2 Military standards.

DOD-STD-2167	Defense System Software Development
MIL-STD-785	Reliability Program for System and Equipment Development and Production
MIL-STD-454	General Requirements for Electronic Equipment
MIL-STD-1472	Human Engineering Design Criteria for Military Systems, Equipment, and Facilities
MIL-STD-415	Design Criteria for Electronic Systems and Associated Equipment
MIL-STD-889	Dissimilar Metals
MIL-STD-1250	Corrosion Protection and Deterioration Control in Electronic Components and Assemblies
MIL-STD-810	Environmental Test Methods and Engineering Guidelines, Engineering Micro Reproduction Systems
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-461	Electromagnetic Emission and Susceptibility Requirements
MIL-STD-462	Measurements of Electromagnetic Interface Characteristics

2.2.3 Other publications.

FAA Order 7032.3	Air Traffic Service Operational Requirements for the Weather Message Switching Center Replacement (WMSCR)
NAS-DD-1000	National Airspace System Level 1 Design Document
NAS-SS-1000	NAS System Specification, Volume II, Functional and Performance Requirements for the National Airspace System, Air Traffic Control Element
FAA 1600.54	Security of FAA Automatic Data Processing Systems and Facilities
FAA 6000.30	Airway Facilities Service Policy Decisions for the Maintenance Program of the 1980s
FAA 7110.80	Data Communications

MIL-HDBK-721	Corrosion and Corrosive Protection of Metals
MIL-HDBK-XXX	Electronic Reliability Design Hand-book, prepublication by RADC Co.
NAS-IR-43020001	NADIN/X.25 Packet Mode User's IRD
NAS-IR-90022507	WMSCR/NWSTG IRD
NAS-IR-25042507	WMSCR/AWP IRD
NAS-IR-25072511	WMSCR/RWP IRD
NAS-IR-94022507	WMSCR/Packet Network User IRD
NAS-IR-94032507	WMSCR/Asynchronous PAD User IRD
NAS-IR-25072401	WMSCR/TMP IRD
NAS-IR-51030002	Maintenance Processor Subsystem To Automation Subsystems IRD
NAS-IR-25072503	WMSCR/WCP IRD
NAS-IR-25082507	WMSCR/ADAS IRD
NAS-IR-94012507	WMSCR/Message Switch Network User IRD
NAS-IR-25072505	WMSCR/CNSP IRD
NAS-IR-92020000	CTS Users IRD

2.3 Non-Government documents. Only versions of the following non-Government documents, of the issue in effect on the date of the invitation for bids or request for proposals, unless otherwise noted, apply to this specification.

2.3.1 Standards.

ANSI X3.66	American National Standard for Advanced Data Communications Control Procedure (ADCCP)
ANSI/IPC-A-610	American National Standards Institute/Institute of Printed Circuits Quality Standard A-610
CCITT X.224	Transport Protocol Specification for OSI
CCITT X.25	1984 Interface between Data Terminal Equipment (DTE) for Terminals Operating in Packet Mode on Public Data Networks

IEEE 200-75	Reference Designations for Electrical and Electronic Parts and Equipment
ISO/OSI 7498	International Standards Organization Standard for Open System Interface
EIA-RS-232	Interface between data terminal equipment and data communications equipment employing serial binary data interchange
EIA-RS-422	Electrical characteristics of balanced voltage digital interface circuits
EIA-STD-449	General-purpose, 37-position and 9-position interface for data terminal equipment and data circuit-terminating equipment employing serial binary data interchange

2.3.2 Publications.

ICAO Annex 10	Aeronautical Telecommunications Vol. 1
ICAO Annex 10	Aeronautical Telecommunications Vol. 2
WMO 306	World Meteorological Organization, Manual on Codes
WMO 386	World Meteorological Organization, Manual on Telecommunications
FCM-S2	Standard Formats for Weather Data Exchange Among Automated Weather Information Systems
FCM-S3	Standard Telecommunication Procedures for Weather Data Exchange on the Interdepartmental Meteorological Data Exchange System
NEC-NFPA-70	National Electric Code (NEC)

2.4 Precedence of documents. When the requirements of the contract schedule, this document, or subsidiary applicable documents are in conflict, the contract schedule shall have precedence. This document shall have precedence over subsidiary applicable documents in the event of conflict between this document and any subsidiary applicable documents.

2.5 Sources of documents. The following is a list of places from which documents may be obtained.

2.5.1 Sources of FAA documents. Copies of FAA specifications, standards, and publications may be obtained from the Contracting Officer, Federal Aviation Administration, 800 Independence Avenue, S.W., Washington, DC 20591. Requests should clearly identify the desired material by number and date, and state the intended use of the material.

2.5.2 Military and federal documents. Single copies of unclassified military and Federal specifications, standards, and publications may be obtained by writing the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120; or calling (215) 697-3321, Monday through Friday, 8:00 a.m. to 4:30 p.m. E.S.T. Department of Defense (DOD) documents may be obtained from Department of Defense, Washington, D.C. 20301.

2.5.3 CCITT documents. Copies of Consultative Committee on International Telegraphy and Telephony (CCITT) standards may be obtained from the International Telecommunications Union, Place des Nations, CH-1211, Geneva 20, Switzerland.

2.5.4 ANSI documents. Copies of ANSI standards may be obtained from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

2.5.5 EIA documents. Copies of EIA standards may be obtained from the Electronic Industries Association, 2001 "I" Street, N.W., Washington, DC 20006.

2.5.6 NFPA documents. Copies of NFPA codes may be obtained from the National Fire Protection Association (NFPA), Batterymarch Park, Quincy, MA 02269.

2.5.7 ISO documents. Copies of ISO standards may be obtained by writing the International Organization for Standardization, 1 Rue de Varemb, CH-1211 Geneva, Switzerland, or from ANSI (see address above).

3.0 REQUIREMENTS

3.1 System definition.

3.1.1 Missions. The WMSCR will serve as a collector and distributor of weather and NOTAM data within the NAS. It also will serve as the gateway for passing weather data between the FAA and the NWSTG of the National Weather Service.

3.1.2 Threat. The principal threats to WMSCR are environmental disaster, electrical grid failure, and unauthorized access. The threat of unauthorized system access shall be minimized by built-in security provisions. The operating system shall ensure its own security and integrity and that of other software components. Access to the system shall be limited to authorized users. Security measures shall be consistent with FAA Order 1600.54, Security of FAA Automatic Data Processing Systems and Facilities.

3.1.3 System modes and states. The WMSCR system shall be capable of operating in the system modes and nodal states described in 3.1.4.4.1.

3.1.4 System functions and system performance requirements. The WMSCR shall provide capabilities in five functional areas:

(a) Communications.

(b) Processing.

(c) Storage and retrieval.

(d) Control.

(e) Development and testing.

Figure 2 is a functional flow diagram for a single WMSCR node and shows the relationships among all major functions except development and testing.

Figure 3 shows the organization of Section 3.1.4.1, Communications function. Figure 4 shows the organization of Section 3.1.4.2, Processing function. Figure 6 shows the organization of Section 3.1.4.3, Storage and retrieval function. Figure 8 shows the organization of Section 3.1.4.4, Control function.

3.1.4.1 Communications function. The communications function shall provide for the acquisition and dissemination of weather and NOTAM information over the interfacing communications network and dedicated circuits. The communications function shall control all communications activities required to achieve connectivity between WMSCR processing function and subscribers and shall permit the exchange of information with users. References to X.25 High-Level LAPB are to be interpreted and implemented in accordance with CCITT X.25, 1984. References to ANSI X3.66 (ADCCP) are to be interpreted per FIPS PUB 71 and implemented per FIPS PUB 78.

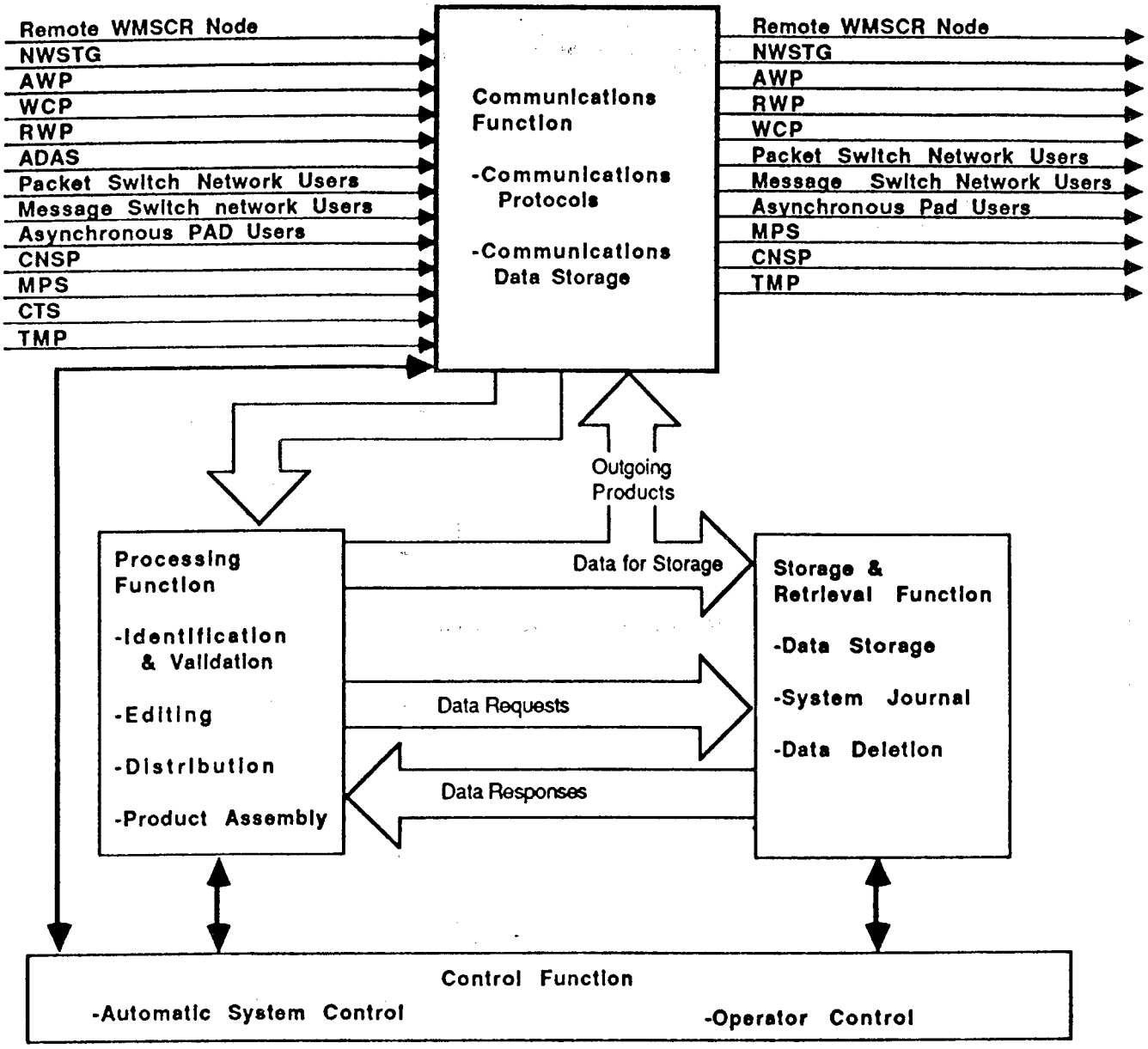

Figure 2. The WMSCR Node Functional Flow Diagram

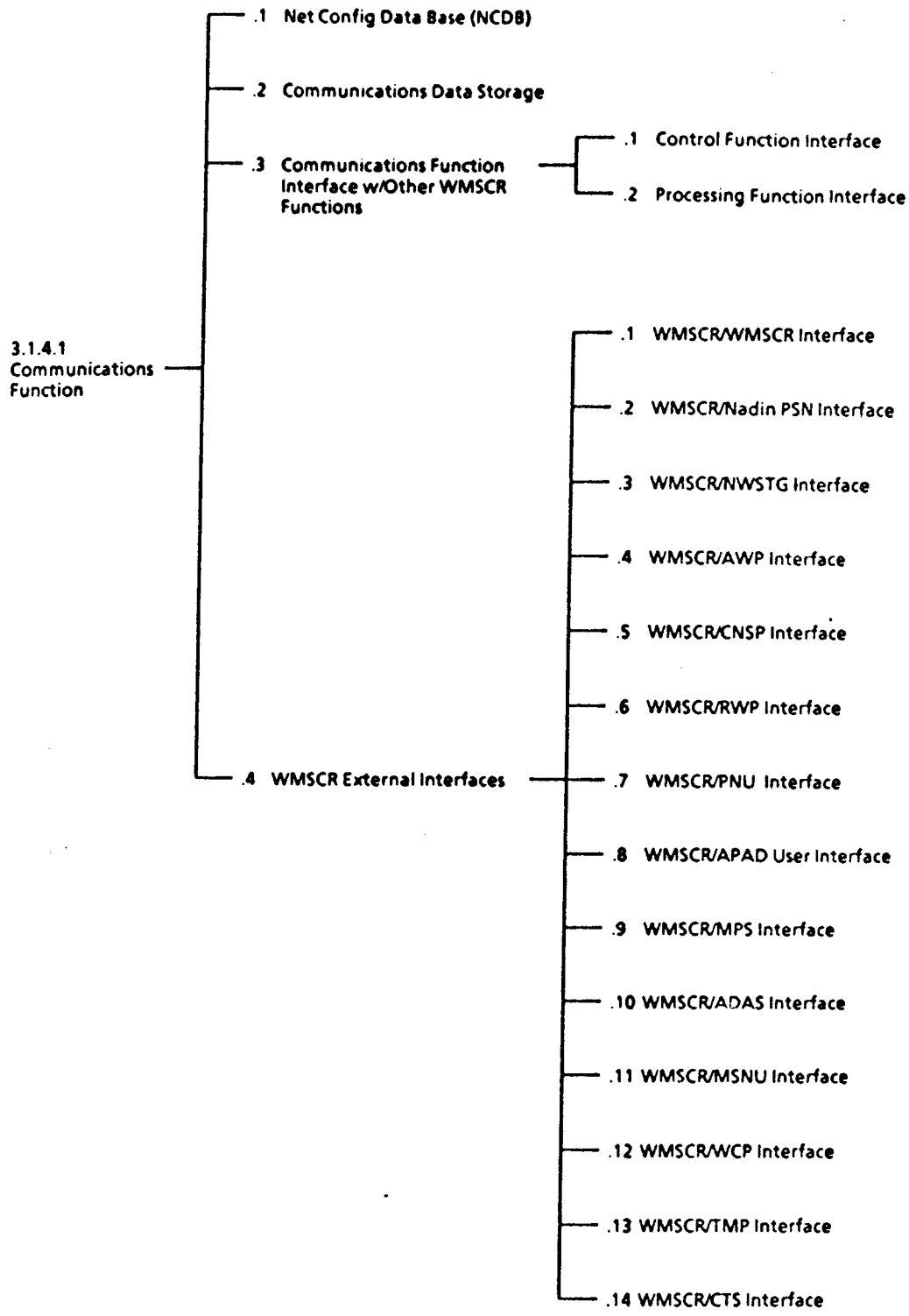

Figure 3. Organization of Section 3.1.4.1, Communications Function

3.1.4.1.1 Network Configuration Data Base (NCDB). The WMSCR shall have an NCDB that contains all information about the WMSCR communications environment and contains information needed to control the operation of the communication function. Conceptually, the NCDB shall contain information about the physical network (physical interfaces) and the logical network (virtual circuits, procedures, etc.). The NCDB shall contain, as a minimum, the following information for each interface:

(a) Interface identification information.

(b) Physical characteristics of the interface.

(c) The logical characteristics of the interface, including all information necessary to establish connectivity to WMSCR users.

(d) Operational status of each interface.

(e) Statistical information about communication activity on the interface (refer to 3.1.4.4.1.5, System Statistics).

(f) System resources associated with each interface.

(g) Identification of the data formats in use on each interface and identification of the processing procedures that apply.

The NCDB statistical and status information shall be be updated automatically by the communications function. In addition, the contents of the NCDB shall be manually modified through the control function.

3.1.4.1.2 Communications data storage. The WMSCR shall have a data storage function that will provide storage for output products awaiting transmission and input data awaiting processing. This facility shall also provide longer term storage for products destined for inoperative interfaces or devices.

3.1.4.1.2.1 Interfaces to data communications storage function. Communication storage shall be partitioned with each partition associated with a destination (either a communication interface or an internal processing function). There shall be two interfaces between the data communications storage function and other functional elements: data enqueue and data dequeue. The data enqueue interface shall allow any program to insert a data element into a partition. The dequeue interface shall allow a program to retrieve the highest priority data element stored in a partition.

3.1.4.1.2.2 Priority data communications storage. Up to eight priority levels shall be defined in the data communications storage function. Data elements shall be dequeued from a partition in First-In-First-Out (FIFO) order within the priority levels. The priority of a data element shall be assigned when the data is enqueued. Product priority is found in the Product Information Data Base (PIDB) (refer to section 3.1.4.2.1.1).

3.1.4.1.2.3 Resiliency to system failure. The data communications storage function shall ensure that products in communication storage shall remain intact in the event of a system failure.

3.1.4.1.2.4 Communication storage configuration. The WMSCR shall automatically allocate or deallocate partitions to system components (circuits) that require communications storage whenever these system components are configured.

3.1.4.1.2.5 Obsolete weather data deletion. The data communications storage function shall tag each enqueued weather data element with its purge time. If weather data in a partition is older than its purge time it shall be deleted.

3.1.4.1.2.6 Storage retention limit. Each output product in communication storage shall have an associated retention limit. The retention limit is the maximum time a weather data element shall remain in communication storage without being dequeued. Any weather data elements older than the retention limit shall be purged, from the communication data storage, even if the product purge time has not expired.

3.1.4.1.2.7 Alternate destination assignment. The WMSCR shall provide a capability to allow one partition to be associated with another so that all present and future data destined for the original partition shall be sent instead to the alternate partition.

3.1.4.1.2.8 Return to storage capability. The data communications storage function shall provide a return to storage capability (without loss of position) for products that could not be successfully delivered.

3.1.4.1.2.9 Capacity of communications data storage. The capacity of data communication storage shall be sufficient to handle all storage requirements for each specific interface for up to 6 hours. Should storage requirements exceed that allocated, the oldest data shall be purged to make room for the new.

3.1.4.1.3 Communications function interface with other WMSCR functions.

3.1.4.1.3.1 Control function interface. The communications function shall interface with the control function (refer to section 3.1.4.4) permitting automated and operator-initiated control of the communications function.

3.1.4.1.3.2 Processing function interface. There shall be a uniform interface at the application layer between the communications function and the processing function. This interface shall permit the bidirectional exchange of data between the communications function and the processing function. A uniform interface means that all data formats and procedures shall be the same for all communication circuits, independent of the data types, protocols, and formats in use on the circuit. The communications data storage function described in 3.1.4.1.2 shall serve as the data pathway between the communications and processing functions.

3.1.4.1.4 WMSCR external interfaces. The communication function shall provide the WMSCR internal processing capabilities required by each of the WMSCR external interfaces. The WMSCR/WMSCR interface document shall be determined as part of the system design activity. The ISO/OSI model shall be used as a framework for the design and development of the communications software.

3.1.4.1.4.1 WMSCR/WMSCR interface. The two WMSCR nodes shall be connected by a dedicated link. The WMSCR/WMSCR interface shall support the data base, data exchange, and data communication requirements of the WMSCR system. Requirements for the dedicated link shall be determined as part of the system design. This interface shall be implemented to achieve the following functions:

(a) Internodal data exchange to provide complete product redundancy within the WMSCR system.

(b) Internal system coordination, synchronization, and status monitoring to provide for the transfer of system tasks between the two nodes while in the failure state and nodal recovery state.

3.1.4.1.4.2 WMSCR/NADIN PSN interface. The NADIN packet switch network is a general purpose X.25 packet switch that is an integral part of the NAS. The NADIN PSN is described in FAA-E-2770, NADIN PSN Functional Specifications. The WMSCR shall use the NADIN PSN as an intermediate interface pathway between the WMSCR and users who are attached to the NADIN PSN directly or through gateways and Asynchronous Protocol Assembler Disassembler (APADs). The WMSCR/NADIN PSN interface shall be the same for each interface that uses the NADIN PSN. Detailed information with regard to this interface can be found in NAS-IR-43020001.

3.1.4.1.4.3 WMSCR/NWSTG interface. Each WMSCR node shall receive meteorological data from the NWSTG. The data shall be initiated from the NWSTG and shall be multiplexed by means of a NWSTG WMSCR Interface Device (NWID) to the two WMSCR nodes (refer to Appendix X). The same links shall be utilized to send meteorological products from the WMSCR to the NWSTG. Data exchanged on these links shall be formatted according to WMO, FCM-S2, and FCM-S3 standards. Identical NWSTG data will be transmitted to each WMSCR node. Detailed information with regard to this interface can be found in NAS-IR-90022507.

3.1.4.1.4.4 WMSCR/AWP interface. The WMSCR shall exchange weather and NOTAM data with the collocated Aviation Weather Processor (AWP) via a dedicated link. The AWP shall also be able to request data from the WMSCR data base on this link. Detailed information with regard to this interface can be found in NAS-IR-25042507.

3.1.4.1.4.5 WMSCR/CNSP interface. The WMSCR and CNSP shall exchange NOTAM data via NADIN PSN. The principal flow of data will be NOTAMs originating in the FSS environment being sent (via the AWP) through the WMSCR to the CNSP for processing, and the CNSP transmitting NOTAMs it has processed to WMSCR for storage and distribution. Detailed information with regard to this interface can be found in NAS-IR-25072505.

3.1.4.1.4.6 WMSCR/RWP interface. The WMSCR and the RWP shall exchange meteorological data. The principal flow of data will be from the WMSCR to the RWPs. Data originating in the RWPs will also be sent to the WMSCR for storage and distribution. The WMSCR shall have the capability to accept RWP requests for data from the WMSCR data base. The WMSCR shall establish a point-to-point connection to each RWP for bidirectional data exchange. Detailed information with regard to this interface can be found in NAS-IR-25072511.

3.1.4.1.4.7 WMSCR/Packet network users interface. This interface shall serve those subscribers served by the WMSC system in Kansas City, Missouri, who will convert to X.25 network and link layer protocols. The network users consist of:

(a) Leased Service A System (SAS) interface units located in each ARTCC.
(FSDPS-1 and number of airline users shall be served by service A gateways).

(b) Carswell Air Force Base (KAWN) located in Fort Worth, Texas.

(c) National Severe Storms Forecast Center (NSSFC) in Kansas City, Missouri.

(d) Airline users, geographically distributed.

(e) Meteorologists Weather Processors (MWPs).

Detailed information with regard to this interface can be found in NAS-IR-94022507.

3.1.4.1.4.8 WMSCR/Asynchronous Packet Assembler Disassembler (PAD) user interface. This interface shall serve those subscribers of the WMSC system in Kansas City, Missouri, who currently are served by an asynchronous interface and who will not convert to X.25 network user interface procedures. There shall be no change in the service provided to these users. The PADs are part of the NADIN packet network and appear to WMSCR as packet network users. The PADs will distribute alphanumeric weather and NOTAM data to the users through 1200-9600 bps asynchronous circuits. Protocol converters provided by the PAD at each of the NADIN PSN packet switch nodes shall convert from the X.25 procedures used by WMSCR to the asynchronous interface seen by the subscriber. Asynchronous PAD users include:

(a) Commercial Airlines.

(b) Subscribers of the "Circuit 604".

Detailed information with regard to this interface can be found in NAS-IR-94032507.

3.1.4.1.4.9 WMSCR/Maintenance Processor Subsystem interface. "The WMSCR and the Maintenance Processor Subsystem (MPS) shall communicate via NADIN PSN. This link shall be used for transfer to the MPS information pertinent to the status of the WMSCR node including periodic status reports (once every hour via an on-line MPS storage file) and any system anomalies to the MPS. The WMSCR shall also support commands from the MPS requesting that status be sent the MPS. Other command functions defined in NAS-IR-51030002 shall be supported. Detailed information with regard to this interface can be found in NAS-IR-51030002."

3.1.4.1.4.10 WMSCR/ADAS interface. The communication function shall receive weather observation taken by automated observing stations through the ADAS. Each of the ADAS units serves multiple observing sites. Hourly the ADAS establishes a network connection with the WMSCR and sends in a collective containing all available observations. Special observations are sent in whenever meteorological conditions change. Detailed information with regard to this interface can be found in NAS-IR-25082507.

3.1.4.1.4.11 WMSCR/message switch network users interface. The WMSCR shall support data exchange with subscribers connected to the NADIN 1A message switch. The NADIN 1A message switch is a store-and-forward message switch using ICAO procedures and message formats. The NADIN 1A message switch is attached to the NADIN packet network via the NADIN packet switch/message switch gateway. Message switch subscribers who exchange data with the WMSCR are the 9020 ATC system and the AFTN network. Detailed information with regard to this interface can be found in NAS-IR-94012507.

3.1.4.1.4.12 WMSCR/WCP interface. The WMSCR and WCP shall exchange weather and NOTAM data. The principal flow will be from the WMSCR to the WCP. The WMSCR shall have the capability to accept WCP requests for data from WMSCR's data base. The WMSCR shall establish a point-to-point connection to each WCP for bi-directional data exchange. Detailed information with regard to this interface can be found in NAS-IR-25072503.

3.1.4.1.4.13 WMSCR/TMP Interface. The WMSCR shall exchange weather data with the TMP. The principal flow will be from the WMSCR to the TMP. The WMSCR shall also respond to requests from the TMP for data. Detailed information with regard to this interface can be found in NAS-IR-25072401.

3.1.4.1.4.14 WMSCR/CTS Interface. The WMSCR shall receive continuous flow of time code data from the CTS. The WMSCR host operating system shall be clock synchronized with the CTS. Detailed information with regard to this interface can be found in NAS-IR-92020000.

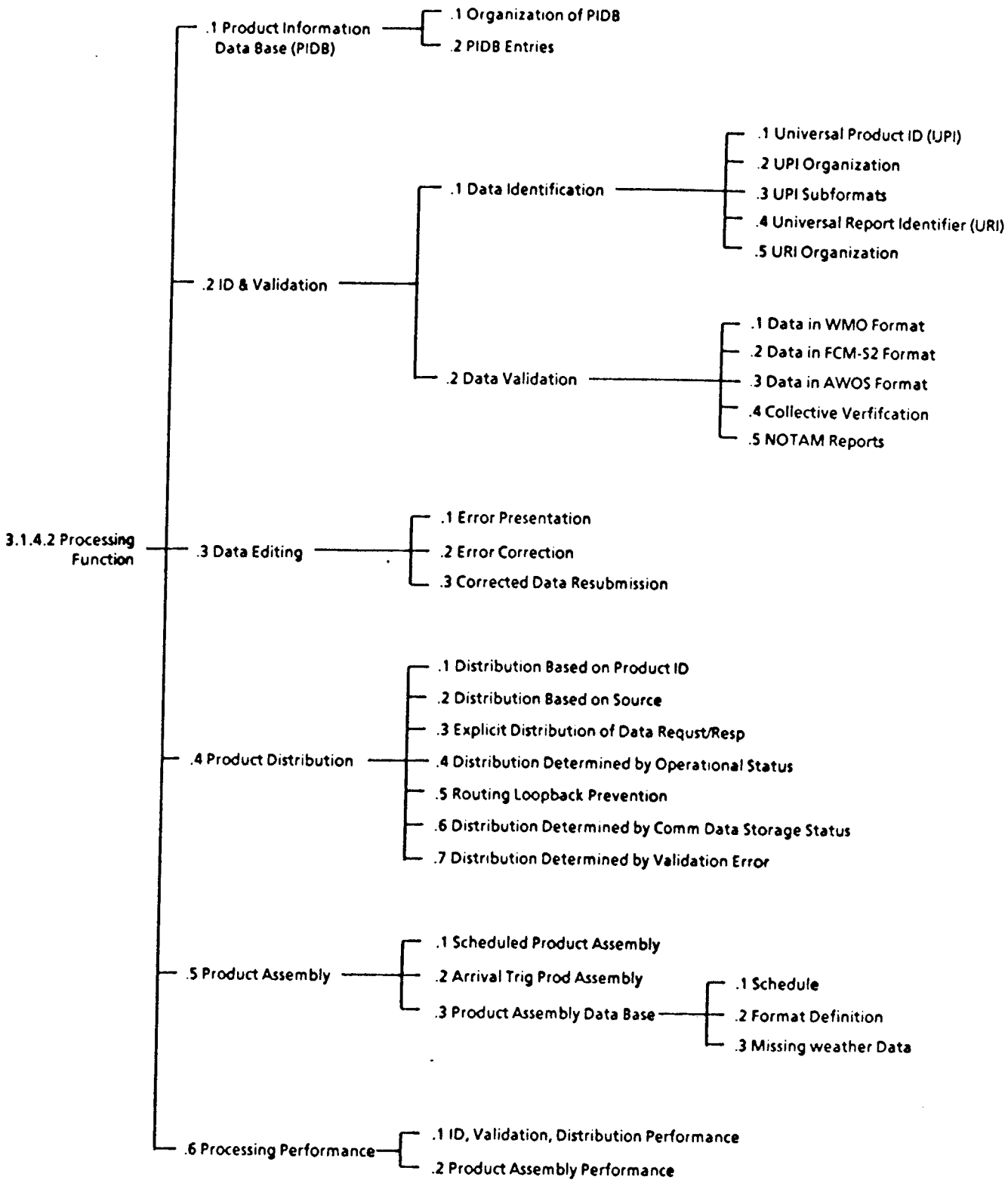

Figure 4. Organization of Section 3.1.4.2, Processing Function

3.1.4.2 Processing function. The processing function shall identify, validate, and distribute products and reports that are received from the communications functions. NOTAMs shall be identified and then sent to the CNSP for processing. This function shall assemble new products from data in the WMSCR weather and NOTAM data bases and distribute these new products. Figure 5 shows the data flow within the processing function. Processing shall consist of functions controlled by adaptation data base. The functions are:

(a) Identification and validation (3.1.4.2.2).

(b) Data editing (3.1.4.2.3).

(c) Product distribution (3.1.4.2.4).

(d) Product assembly (3.1.4.2.5).

The adaptation data bases are:

(a) Product Information Data Base (PIDB) (3.1.4.2.1).

(b) Product Assembly Data Base (PADB) (3.1.4.2.5.3).

3.1.4.2.1 Product Information Data Base. The WMSCR shall have as part of the adaptation data base, the PIDB, that contains all information required for the WMSCR to perform processing functions. This data base shall contain information necessary for describing the processing of data in all formats handled by WMSCR. The PIDB as described herein is conceptual, and its organization, format, and exact contents shall be determined during the design phase.

3.1.4.2.1.1 Organization of the Product Information Data Base. The PIDB shall be a direct access data base in which individual records can be addressed by using the universal product identification field, which is described in 3.1.4.2.2. The PIDB shall be on-line. It shall be accessible and capable of being updated automatically and manually. The WMSCR shall provide the capability for the operator to create or update an entry in the PIDB and to specify the required routing, validation, and other PIDB information. The data base shall maintain the same level of retrieval efficiency before and after updates so that there shall be no reduction in retrieval performance. The following information shall be included in the PIDB as a minimum:

(a) Universal product identification (3.1.4.2.2).

(b) Format and validation information (3.1.4.2.2).

(c) Product distribution information (3.1.4.2.4).

(d) Format definitions used to trigger product assembly (3.1.4.2.5).

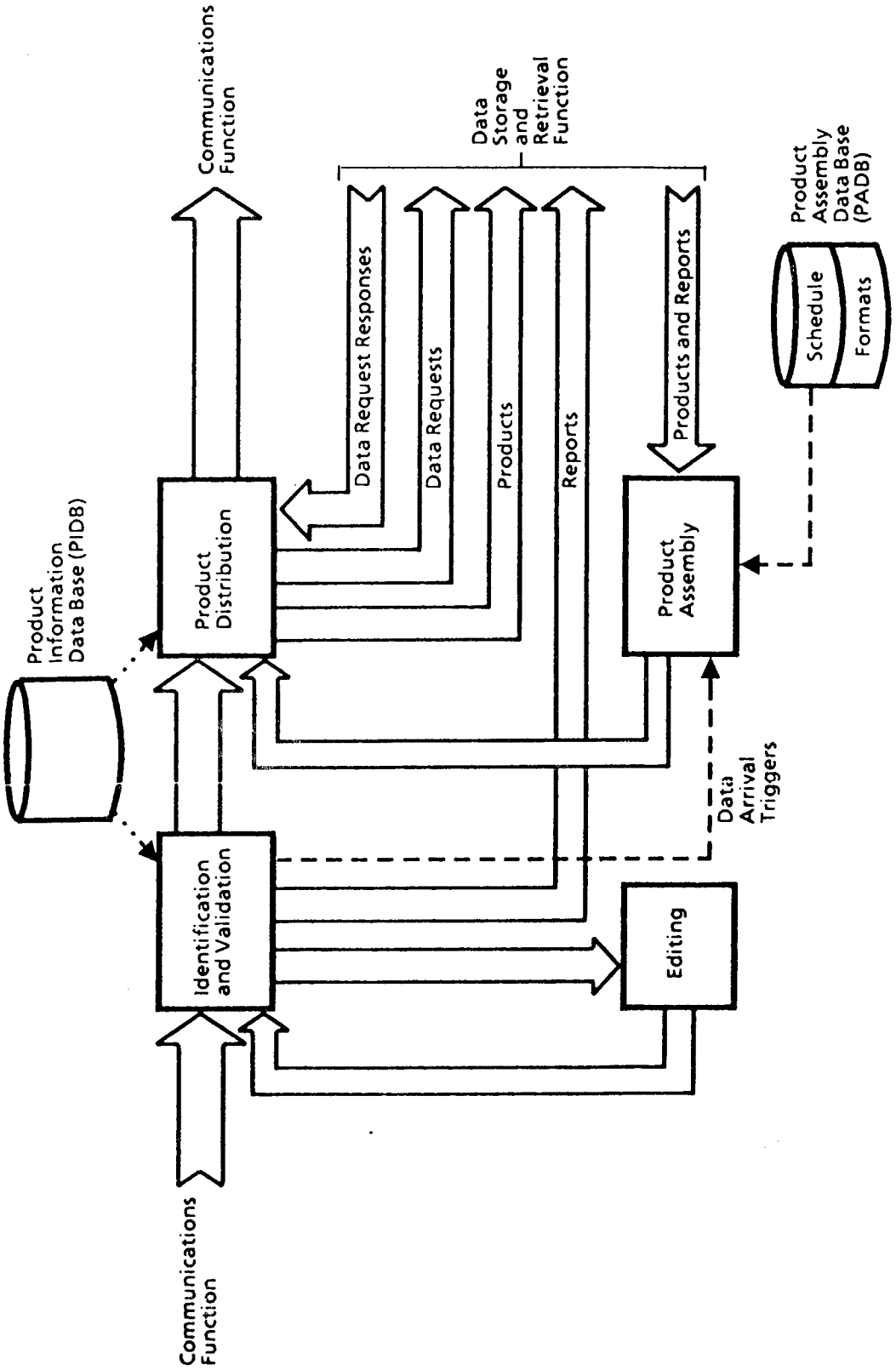

Figure 5. General Data Flow Within the WMSCR Processing Function

(e) Product priority (3.1.4.4.2.2.2.1.5).

(f) Data deletion information (3.1.4.3.4).

(g) Collective breakdown processing information (3.1.4.3.2.2.2).

(h) Statistics on data reception (3.1.4.4.1.5).

3.1.4.2.1.2 PIDB entries. Each PIDB element shall refer to one identifiable product type. It shall contain information about how that product is to be processed. The PIDB shall be able to maintain information for a minimum of 20,000 different products.

3.1.4.2.2 Identification and validation.

3.1.4.2.2.1 Data identification. The processing function shall identify all received data. Depending on the interface, the data may already be formatted as an ADU or require extensive reformatting. The identification function shall ensure that all data shall be converted to a valid Application Data Unit (ADU) format as defined in Appendix III. Received data can be a product, a report, or a data request. A product is defined as an identifiable unit of data associated with a Universal Product Identifier (UPI) and having a corresponding entry in the PIDB. A report is a unit of data associated with a Universal Report Identifier (URI) and having a corresponding entry in the SIDB. Weather reports are sent directly to the storage function. After identification, unprocessed NOTAM reports are forwarded to the Consolidated NOTAM System Processor (CNSP), at both NAWPFs, for processing. Data requests are likewise sent to the retrieval function. Input data is processed as defined below. Each interface shall have specific procedures for identifying and formatting received data. These identifications shall be specified in the NCDB. In cases where multiple formats arrive on the same interface, the WMSCR shall examine the data to determine which identification and formatting procedures are to be used. The result of the identification procedure shall be a Universal Product Identifier (UPI) contained in the ADU for each product. The WMSCR shall have capability to recognize duplicate weather products. A duplicate weather product is defined as any product received with a UPI that is identical to one already received. Duplicate products shall be written to the on-line journal by the WMSCR (refer to section 3.1.4.3.5) but shall not be processed further. If data cannot be identified, it shall be sent to the manual editing function for review, error correction, and resubmission to the processing function (refer to section 3.1.4.2.3.).

3.1.4.2.2.1.1 Universal product identifier. All products processed by the WMSCR shall be identified by using the UPI. All incoming data identification and classification methods shall be converted into this UPI.

3.1.4.2.2.1.2 UPI organization. The UPI format is shown in Appendix II. The first byte of the UPI defines the subformat corresponding to the external format of the data. Bytes 1-10 form the UPI key. The key is the label of an entry in the PIDB. There shall be one PIDB entry for each unique UPI key handled by the WMSCR. The balance of the UPI (bytes 11 through 16) contains additional product identification fields:

(a) date

(b) time

(c) version number

3.1.4.2.2.1.3 UPI subformats. To account for different external formats, the WMSCR shall make provision for subformats of the Universal Product Identification. Two subformats that have been identified for use in the WMSCR are:

(a) World Meteorological Organization (WMO) Format.

(b) Federal Coordinator for Meteorological Service (FCM-S2) Format.

The UPI subformats are found in Appendix II.

3.1.4.2.2.1.3.1 Data in WMO format. The WMSCR shall identify alphanumeric data received in WMO format and shall place the WMO header data into a UPI subformat, as defined in Appendix II. Additional interfaces that use the WMO format are described as follows.

3.1.4.2.2.1.3.1.1 Messages in ICAO format. Messages in ICAO format, as defined in Appendix VII, will be addressed by the NADIN message switch to WMSCR. The NADIN message switch gateway will remove the ICAO header, but the rest of the message will remain intact. These messages will contain either meteorological data (for storage and retransmission) or requests for data. The WMSCR shall determine which type of data is contained in the received message and shall place the product information either in the WMO ADU format or in a data request ADU format, as defined in Appendix III. If the incoming data does not contain a WMO header nor a valid data request format, the data shall be routed to the manual edit function.

3.1.4.2.2.1.3.1.2 ADAS formats. The WMSCR will receive AWOS data received from ADAS units via the NADIN packet switch network. These data will be identified by a WMO header added by the ADAS. The WMSCR shall place the product identification information into a WMO ADU format.

3.1.4.2.2.1.3.2 Data in FCM-S2. The WMSCR shall identify graphic data received in FCM-S2 format. The data identification block information shall be placed into a vector graphic ADU format, as described in Appendix II.

3.1.4.2.2.1.3.3 Data request formats. The WMSCR will receive data requests from external interfaces and shall construct an ADU for the data request according to the format defined in Appendix IV.

3.1.4.2.2.1.4 Universal Report Identifier (URI). The WMSCR shall identify all reports using the URI. All incoming report identification and classification methods shall be converted into this URI. The URI forms the first 16 bytes of the ADU.

3.1.4.2.2.1.5 URI organization. The URI format is defined in Appendix II. The key is the label of an entry in the Station Identification Database (SIDB), which is described in section 3.1.4.3.1.1.1.2. There shall be an SIDB entry for each unique URI key handled by the WMSCR. The balance of the URI key contains additional identification fields:

(a) date

(b) time

(c) version number

3.1.4.2.2.2 Data validation. During data identification, the WMSCR shall perform validation of the header information on all received data. Any failure to properly identify data shall represent a data validation violation, and this data shall be considered to be in error. Any weather data with detected errors shall be sent to the manual edit function (refer to section 3.1.4.2.3). Any NOTAM data with detected errors shall be sent to the communications function as determined by the validation error (refer to 3.1.4.2.4.7). The validation criteria to be applied shall be determined by the interface on which the data arrives. This information shall be stored in the NCDB. In cases where multiple formats arrive on the same interface, the data shall be examined and correlated with information in the NCDB to determine which validation shall be used.

3.1.4.2.2.2.1 Data in WMO format. The WMSCR shall check the WMO header for a valid format (refer to Appendix V). The WMSCR shall perform the following checks:

(a) Verify that the type field in the WMO header is in the format of four alpha characters, either alone or followed by one or two numeric characters, e.g., "SAUS", "SMUS1", or "USBU43".

(b) Verify that the origin field in the WMO header is in the format of four alpha characters.

(c) The combination of the 6-byte type field and the 4-byte origin field shall constitute the UPI key to the PIDB. The WMSCR shall verify that there is a corresponding record in the PIDB.

(d) Verify that the date/time field in the WMO header is in the format of 6 numeric bytes. The day field shall be in the range of 1 to 31 (28, 29, or 30 for those months that apply). The hour field shall be in the range of 0 to 23. The minute field shall be in the range of 0 to 59. The WMSCR shall also perform a check to determine the reasonability of the date/time field. The PIDB shall define the permitted variance between the date/time field and the receipt time for each message type; this shall be an adaptable parameter assignable for each message type in increments of hours with a range of 0 to 12.

(e) Verify that the modifier field, if present, is in the form specified by WMO publication No.386 (see Appendix V). The modifier field identifies corrected, amended, or retarded messages and the version number of each.

3.1.4.2.2.2.2 Data in FCM-S2 Format. The WMSCR shall verify that there exists a PIDB corresponding to the product identifier field in the product identification block.

3.1.4.2.2.2.3 Data in AWOS format. The AWOS data from the ADAS interface shall be checked as any other data received in WMO format. (refer to 3.1.4.2.2.2.1).

3.1.4.2.2.2.4 Collective verification. The WMSCR shall verify internal format and content information for collectives, as described in 3.1.4.3.2.2.2.4.

3.1.4.2.2.2.5 NOTAM reports. The WMSCR shall check the NOTAM data for a valid format (refer to Appendix III). The WMSCR shall perform the following checks.

(a) Verify that the NOTAM category code is in the format of five alphanumeric characters (see Appendix III.)

(b) Verify that the NOTAM sequence number is in the format of two numeric characters followed by a slash, which is followed by three numeric characters.

(c) Verify that the station field is in the proper format.

(d) Verify that the station of origin exists in the SIDB.

3.1.4.2.3 Data editing. The WMSCR shall provide the capability for operator review and correction of data that have been found to be in error by the validation process. Subsection 3.1.4.4 defines the operator command functions that are available to the operator to perform data editing. Performance and response requirements for editing are covered in 3.1.4.4.3.3.

3.1.4.2.3.1 Error presentation. The WMSCR shall provide the capability to edit data with errors at one of the standard WMSCR operator terminals described in 3.1.4.4. The WMSCR shall permit editing to be performed simultaneously at any or all command terminals. The WMSCR shall permit operators to initiate data editing. Data found to be in error by the validation function shall be placed in a queue reserved for data in error. The WMSCR shall inform the operator that data is waiting for correction by sending an alert indicator to any command terminal where editing has been initiated. The highest priority data in the queue shall be displayed on the terminal screen upon operator request. If the data to be reviewed is alphanumeric, the entire text shall be displayed. The WMSCR shall describe the error in an area of the screen reserved for error description. The error shall be identified either by the cursor, by highlighting, or by a similar method. For graphic products the full data identification, including type of data, geographic area of coverage, time of receipt, origin, and validation period shall be displayed.

3.1.4.2.3.2 Error correction. The WMSCR shall provide the capability for the operator to correct data formats through text correction using the control terminal manual text editing features or through the entry of a commands defined in 3.1.4.4.2.2.2.3, Editing control.

3.1.4.2.3.3 Corrected data resubmission. After correction, the WMSCR shall send data back to the processing function for identification, validation, and distribution. If the error is uncorrectable, the WMSCR shall provide the capability for the operator to purge the data. All purged data shall be written to the on-line journal. After resubmission of the corrected data, the WMSCR shall display the next error data in the queue for correction. The WMSCR shall provide the operator with the option to terminate error correction activities at any time (incomplete manually edited data shall be automatically requeued for data editing).

3.1.4.2.4 Product distribution. The WMSCR shall automatically distribute all products to predefined destinations, both external and internal, appropriate for that product type and for the system configuration. The distribution function shall determine the desired destinations of each product from information in the PIDB, in the list of destinations associated with the source of the message; and by reference to the WMSCR operational configuration.

3.1.4.2.4.1 Distribution based upon product identification. The WMSCR shall automatically distribute a product based upon that product's identification. The PIDB entry identified by the key portion of each product's UPI shall contain a list of destination names. The maximum number of destination names associated with any PIDB can equal the number of destinations configured into the NCDB.

3.1.4.2.4.2 Distribution based upon source. The WMSCR shall automatically distribute a product based upon its source. Each source shall have its own associated list of destinations. All data that enters the system shall be immediately identified, if it is a product, it shall be sent to each destination in the list, if any. This routing is additive to the normal product routing specified in the PIDB. A source can be an internal program or an external interface.

3.1.4.2.4.3 Distribution of data request responses. The WMSCR shall provide the capability to distribute responses to data requests back to the originator.

3.1.4.2.4.4 Distribution determined by operational status. Product distribution shall be affected by the operational status of both WMSCR nodes and the operational status of all external interfaces. Products shall not be transmitted to an interface that is being supported by the remote node.

3.1.4.2.4.5 Routing loopback prevention. The WMSCR shall prevent any data from being routed back to its source, except as a part of an assembled product.

3.1.4.2.4.6 Distribution determined by communication data storage status. The WMSCR shall have the capability to allow the operator to associate one destination with an alternate destination as described in 3.1.4.1.2.7 and 3.1.4.4.2.2.1.2.4. The WMSCR shall modify normal routing to reflect this new destination.

3.1.4.2.4.7 Distribution determined by validation error. The WMSCR shall automatically distribute NOTAMs received with a validation violation back to CNSP, along with a NOTAM category code (refer to Appendix III).

3.1.4.2.5 Product assembly. The WMSCR shall provide the capability to construct new products from data in the weather and NOTAM data bases. The WMSCR shall not modify the content of any meteorological or NOTAM data. The operation of product assembly shall be controlled by an adaptation data base called the Product Assembly Data Base (PADB). Each assembled product created shall be transmitted to the communication function (refer to section 3.1.4.2.4) for distribution to external interfaces. Each time a product is assembled, an event notification shall be sent to the system event log (refer to section 3.1.4.4.1.4). The assembly of a product shall be triggered by one of two events:

(a) When the current time matches the assembly schedule of an element in the PADB schedule. This is called scheduled assembly.

(b) By the arrival of data into the system which the PIDB indicates triggers the assembly of another product. This is called arrival triggered product assembly.

3.1.4.2.5.1 Scheduled product assembly. Product assembly based on the PADB schedule shall operate automatically. The PADB schedule defines the time(s) when products are to be assembled. The PADB formats define the desired contents of the products to be assembled.

3.1.4.2.5.2 Arrival triggered product assembly. Product assembly shall automatically occur upon the arrival of specific triggering data. The PIDB entry for the triggering product shall specify at least one PADB format definition. When the triggering data is received, the new product defined by the PADB format shall be constructed. The PIDB entry for each product shall be able to specify a minimum of 50 PADB format definitions.

3.1.4.2.5.3 Product Assembly Data Base (PADB). The WMSCR product assembly function shall be controlled by the PADB. There shall be two functional parts of the PADB:

(a) The schedule.

(b) The format and content definitions.

3.1.4.2.5.3.1 Schedule. The PADB 24-hour schedule shall define the times when a product is to be assembled. The schedule shall be ordered by time of day with a resolution of one second. There can be more than one entry for the same time. Each entry in the schedule shall refer to a format definition. More than one schedule entry may refer to the same format definition. The schedule shall accommodate a minimum of 20,000 entries.

3.1.4.2.5.3.1.1 Day-of-week selection. Each PADB schedule entry shall have the option of specifying one or more days of the week. The WMSCR product assembly function shall assemble the product only on the specified day(s) of the week.

3.1.4.2.5.3.1.2 Temporary entries. The WMSCR shall provide the capability for a schedule entry to indicate a one-time execution. After the internal assembly of the product, the WMSCR shall delete the schedule entry.

3.1.4.2.5.3.1.3 Entry suppression. The WMSCR shall provide the capability for a schedule entry to be skipped by the product assembly function. This suppression can be temporary or permanent. For temporary suppression, the schedule entry is ignored only once then returned to normal status. For permanent suppression,the entry is skipped until its status is changed by operator command.

3.1.4.2.5.3.2 Format definition. The WMSCR shall have PADB format entries that shall be used by the product assembly function to determine the desired contents of each product to be assembled. A format definition shall consist of a file (or similar data structure) that contains text that can be created or modified by the operator using the editing features of the command terminal. A PADB format provides a visual representation of the product to be assembled. This format definition shall contain one or more of the following text elements:

(a) Static text.

(b) Variables.

(c) Product and report references.

3.1.4.2.5.3.2.1 Static text. Format definitions shall contain static text (normally the header of a message label or other imbedded constants). The WMSCR shall duplicate all static text in the product being assembled.

3.1.4.2.5.3.2.2 Variables. A variable shall be identified by a reserved text string. Three variables shall be initially defined:

(a) Current date.

(b) Current time (hour minute).

(c) The WMSCR system identification.

Whenever the WMSCR recognizes a variable in the PADB format, the variable value shall replace the reserved text string.

3.1.4.2.5.3.2.3 Product and report references. The WMSCR shall provide the capability for a format definition to contain references to one or more products or reports in the weather and NOTAM data base(s). These references shall be identified by a reserved text string followed by a valid data base query. When one of these references is recognized, the WMSCR shall insert the full text of the referenced product or report into the assembled product. All features of the query language, as defined in Appendix IV, shall be supported for usage in the format definitions.

3.1.4.2.5.3.3 Missing weather data. If expected weather data has not been received the WMSCR shall indicate that the data is missing or unknown to WMSCR by inserting a predefined text string into the product being assembled.

3.1.4.2.6 Processing performance. The processing function shall meet the following minimum performance criteria while processing all data magnitudes defined in Appendix I, System Traffic Throughput Test Data Set.

3.1.4.2.6.1 Data identification, validation, and distribution performance. All data defined in the test data set shall be identified, validated, and distributed in a mean time of 15 seconds and in less than 30 seconds, 95 percent of the time. Data requests and urgent products (those with the highest priority only) shall be identified, validated and distributed in a mean time of 1.0 second and in less than 3.0 seconds, 95 percent of the time. Performance shall be measured from the time the last byte of data is queued to the processing function until the last byte of data is queued to the communication function.

3.1.4.2.6.2 Product assembly performance. All products defined in the test data set shall be assembled in a mean time of 30 seconds and in less than 60 seconds, 95 percent of the time. Performance shall be measured from the scheduled assembly time until the last byte of the product is queued to the communication storage function for transmission.

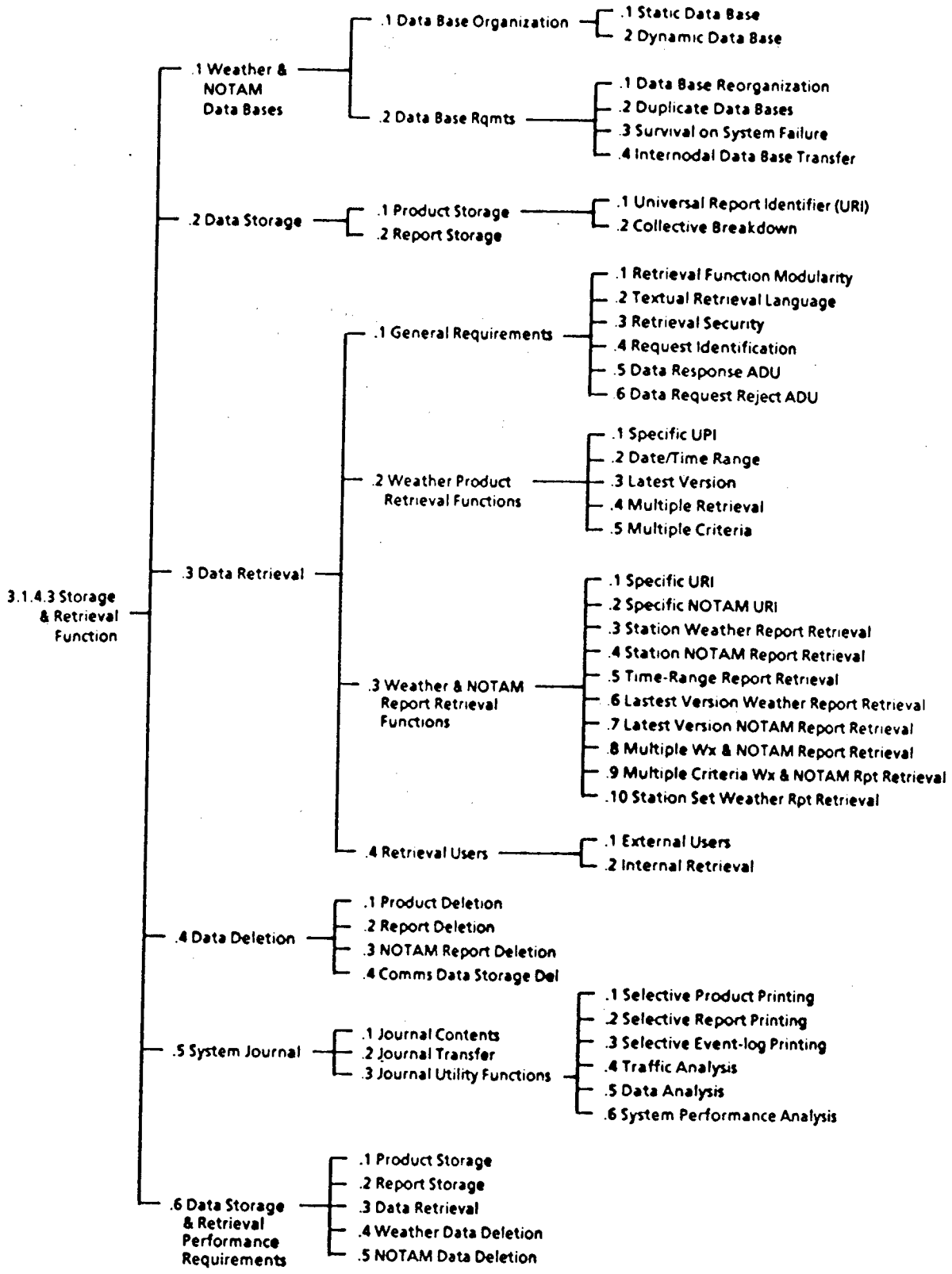

Figure 6. Organization of Section 3.1.4.3, Storage and Retrieval Function

3.1.4.3 Storage and retrieval function. The storage and retrieval function consists of the following functional elements:

(a) Weather and NOTAM data base(s).

(b) Data storage.

(c) Data retrieval.

(d) Data deletion.

Figure 7 shows the data flow within the storage and retrieval function. Data shall be received from the processing function and stored in the weather and NOTAM data base(s). A report is a unit of data associated with an observing or reporting station. Reports are most often received as parts of products. A product is a unit of data associated with an entry in the PIDB. Within WMSCR two principal product types are used: alphanumeric products identified by a WMO header and graphics products identified by the FCM-S2 identifier. A product containing one or more reports is called a collective. The process of isolating reports in a product is called collective breakdown. The retrieval function permits the retrieval of products and reports for external users as well as for WMSCR internal functions. The deletion function purges obsolete data from the weather and NOTAM data base(s).

3.1.4.3.1 Weather and NOTAM data base(s).

3.1.4.3.1.1 Data base organization. The WMSCR shall maintain data base(s) defined as either static or dynamic.

The static data bases shall contain information about products and reports. It shall also consist of any structures required for the retrieval of data from the dynamic data base(s). The dynamic data base(s) shall consist of weather and NOTAM data received and subsequently used in the assembly of products.

3.1.4.3.1.1.1 Static data base.

3.1.4.3.1.1.1.1 Product Information Data Base. The WMSCR shall maintain a PIDB that contains all static information about each product received by the WMSCR. In addition, the organization of the PIDB shall permit the logical association of all unexpired products in the dynamic data base(s) with their corresponding PIDB entry.

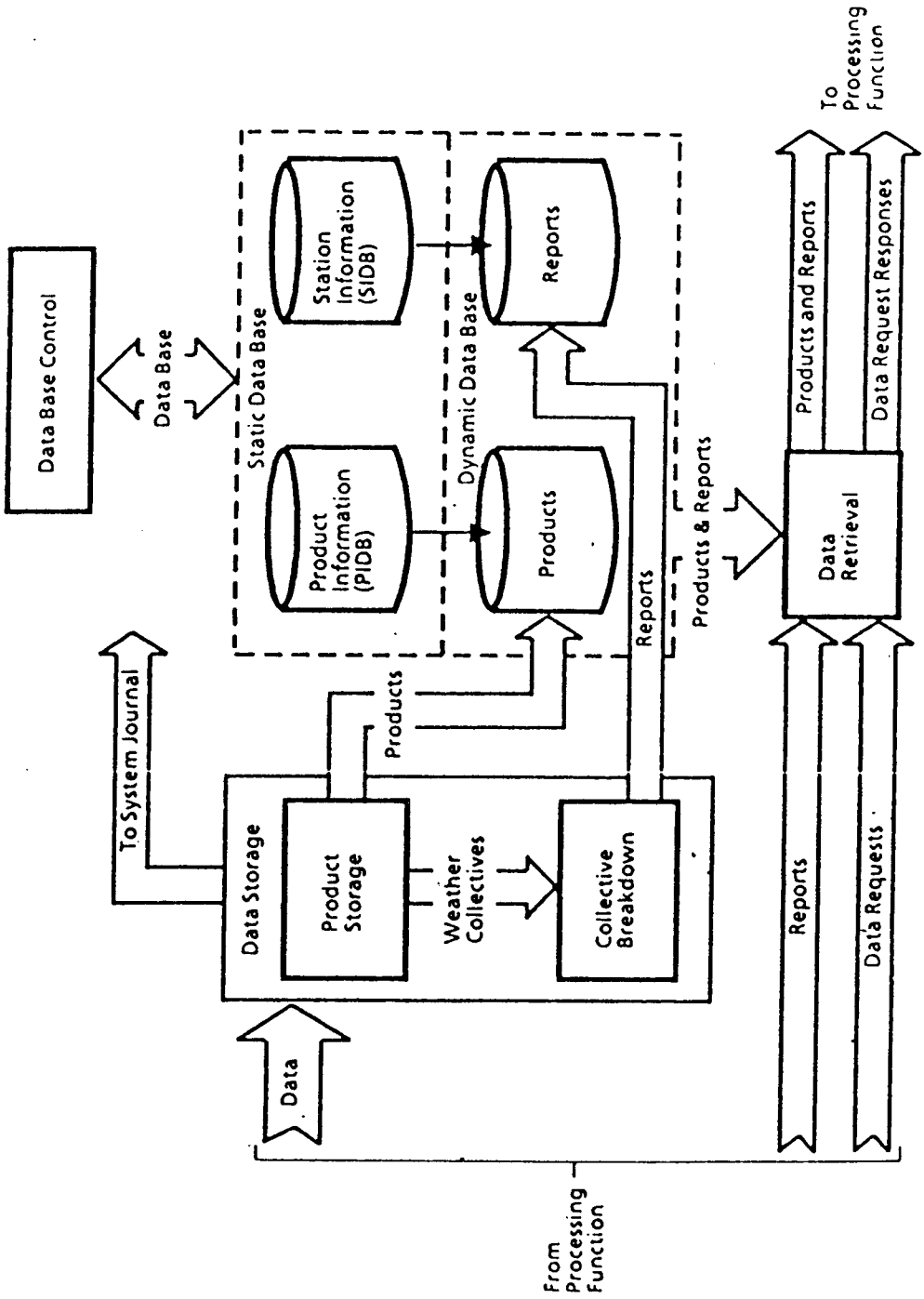

Figure 7. General Data Flow within the WMSCR Storage and Retrieval Function

3.1.4.3.1.1.1.2 Station Information Data Base. The WMSCR shall maintain a SIDB that contains all static information about reporting stations. The SIDB shall be a direct access data base in which individual records can be addressed by the Universal Report Identifier (URI) described in 3.1.4.3.2.2.1. SIDB entries shall be created and modified by operator command as described in 3.1.4.4.2.2.3.1. The SIDB shall be on-line during updates and shall have the same retrieval efficiency before and after operator updates. There shall be an SIDB entry for each station about which reports are received. An SIDB entry can also represent a pseudo station that is not a physical observing site, but an identification to which reports can be catalogued. The SIDB shall have a minimum capacity of 20,000 entries. The SIDB shall, as minimum, contain the following information about a station:

(a) Station identification.

(b) Station title or description.

(c) Weather report retention information.

3.1.4.3.1.1.2 Dynamic data base(s). The WMSCR shall maintain dynamic weather and NOTAM data base(s). All data in this data base shall be individually accessible. The dynamic data bases shall be in a continual state of renewal and change as new data is received and old data is deleted. The dynamic data base(s) shall be divided into two sections:

(c) Product data base. The product data base shall contain units of weather data organized by the Universal Product Identification.

(d) Report data base(s). The report data base shall contain units of weather and NOTAM data organized by reporting station.

3.1.4.3.1.1.2.1 Dynamic product data base. The WMSCR shall store products in the dynamic product data base identified by their full UPI. Products shall remain in the dynamic product data base until expiration of their retention period. Products shall be linked to their respective PIDB entry.

3.1.4.3.1.1.2.2 Dynamic report data base(s). The WMSCR shall store weather and NOTAM reports in the dynamic report data base(s) identified by their full Universal Report Identifier (URI). Weather reports shall remain in the dynamic report data base until expiration of their retention period. NOTAM reports shall remain in the dynamic report data base until a NOTAM cancellation report, specifying a particular NOTAM in the dynamic data base, is received from the CNSP. All reports shall be linked to their respective SIDB entry.

3.1.4.3.1.2 Data base requirements.

3.1.4.3.1.2.1 Data base reorganization. The data base(s) shall not require periodic off-line reorganization, during which time it would be unavailable for access.

3.1.4.3.1.2.2 Duplicate data base(s). At each node, the WMSCR shall maintain duplicate data bases that meet the following requirements:

(a) Each data element in the weather and NOTAM data base(s) shall be duplicated on separate physical units.

(b) If a single element, or multiple elements, of the data base(s) becomes unreadable, the corresponding elements from the duplicate data base(s) shall automatically be utilized.

(c) The total or partial failure of one data base shall not cause any interruption of WMSCR service.

(d) The WMSCR shall initiate automatic data base repair activities to reconfigure around the failed element(s) and to recreate the failed data base elements to ensure continued data base redundancy.

(e) Data base repair activities shall not interfere with normal WMSCR operational functions.

(f) If automatic data base repair, as defined in (e) above, is not possible due to serious physical problems, the WMSCR shall also notify the operator. After the completion of physical repairs, the WMSCR shall recreate the failed portion of the data base(s).

3.1.4.3.1.2.3 Survival on system failure. The WMSCR data base shall be able to survive a system failure. The data base design shall ensure that all data received and previously applied to the weather and NOTAM data base(s) shall be recoverable in the event of a nodal failure or a total system failure (refer to 3.1.4.4.1.3).

3.1.4.3.1.2.4 Internodal data base transfer. The WMSCR shall provide the capability to transfer all or a portion of the static and dynamic data base(s) from one node to another across the internodal link. Refer to 3.1.4.4.1.2.9.

3.1.4.3.2 Data storage. The WMSCR shall store data received from the processing function. There are two classifications of data storage. The first is data that is identified by a UPI code. It shall be stored in the dynamic product data base. The second is data identified by a reporting station. It shall be stored in the dynamic report data base(s).

3.1.4.3.2.1 Product storage. The WMSCR shall store weather products in their entirety in the dynamic product data base. The WMSCR shall store only those weather products that have a valid UPI and a non-zero retention period as specified in the PIDB. When a weather product is received, the WMSCR shall add historical information to the PIDB containing information about the product. The following historical information shall be included:

(a) Date time.

(b) Receipt time.
(c) Version.

This historical weather information shall remain in the dynamic product data base until the product is purged from the dynamic area. The only limit to how much information can be stored in a dynamic product data base shall be the storage space available in the dynamic section.

3.1.4.3.2.2 Report storage. The WMSCR shall store weather and NOTAM reports in the dynamic report data bases(s). When a weather report is isolated by collective breakdown, the WMSCR shall store information in the SIDB containing information about the report. The following information shall be included:

(a) Date time.

(b) Report type.

(c) Receipt time.

(d) Sequence number/version.

This information shall remain in the SIDB until the report is purged from the respective dynamic data base.

3.1.4.3.2.2.1 Universal Report Identifier (URI). The WMSCR shall identify all reports by the URI. The URI shall have a 16-byte format, as described in Appendix II. The first six bytes shall be the station identification, which must match an entry in the SIDB.

3.1.4.3.2.2.2 Collective breakdown. The WMSCR shall process designated weather collectives to isolate weather reports. Upon breakdown of each collective, individual reports shall be stored in their respective weather report data base(s). The PIDB shall designate whether data is to undergo collective breakdown (see 3.1.4.2.1.1. (g)) and which parameters apply to the breakdown process.

3.1.4.3.2.2.2.1 Collective breakdown adaptation data base. The collective breakdown process shall be controlled by an adaptation data base. This data base shall serve the purpose of permitting the breakdown of new data without

requirement for further applications and/or configuration code modification. This data base shall specify the following information for each type of collective to be broken down:

(a) Report delimiter character.

(b) Size of the station identification in the report.

(c) Relative field in the report which is the station identification.

(d) The location in the data where the first report is located.

(e) Minimum and maximum report size.

3.1.4.3.2.2.2.2 Collective breakdown general procedures. The WMSCR shall perform the following functions as part of the collective breakdown process:

(a) Isolate each report by locating the report delimiters.

(b) Locate the station identification within the report.

(c) Build the URI from the station identification found in the report and the type and date/time information from the UPI.

(d) Store the report text in the dynamic report data base(s).

(e) Create an entry in the SIDB describing the dynamic report data base(s) entry.

(f) Linkage of report to corresponding SIDB location.

3.1.4.3.2.2.2.3 Collective breakdown specific procedures. The WMSCR shall perform collective breakdown for data as defined in Appendix VIII.

3.1.4.3.2.2.2.4 Collective breakdown verification. The WMSCR shall queue for editing any data where collective breakdown discovers a format error. All reports that are not affected by the error shall be stored in the dynamic report data base(s). These errors include the following conditions:

(a) An unknown station identification or a station ID that is the wrong size.

(b) A report not properly delineated.

(c) Report size not within limits.

3.1.4.3.2.2.2.4.1 Duplicate weather report check. The WMSCR shall recognize the reception of a duplicate weather report. A duplicate weather report is one that has an identical URI to one already in the dynamic weather report data base. Duplicate weather reports shall not be added to the dynamic weather report data base.

3.1.4.3.3 Data retrieval. The WMSCR shall provide the capability for external users and internal functions to access the data stored in the dynamic weather and NOTAM data base(s). Specific information about the external data retrieval capabilities are found in Appendix IV.

3.1.4.3.3.1 General requirements. The data retrieval function shall have the overall characteristics and capabilities described in the following subsections.

3.1.4.3.3.1.1 Retrieval function modularity. The WMSCR shall have a function to retrieve products from the dynamic product data base(s).

3.1.4.3.3.1.2 Textual retrieval language. The WMSCR shall provide the capability for a textual retrieval language to support the data requests of system users (remote subscribers and local WMSCR operators). The textual language shall employ syntactic/semantic consistency, flexibility, uniformity, and simplicity of design without sacrificing user expressiveness. The textual retrieval language syntax, although defined in Appendix IV, must be capable of expansion as new and/or alternative retrieval format requirements become necessary.

3.1.4.3.3.1.2.1 Table defined textual retrieval language. The WMSCR textual retrieval language shall be controlled by an adaptation data base. It shall be possible to develop new retrieval capabilities through modifications to the adaptation data base. All retrieval parameters shall be modifiable by the WMSCR control function.

3.1.4.3.3.1.2.2 Textual retrieval language interactive capability. The textual retrieval language shall be suitable for interactive use with the WMSCR control and external user terminals. The language shall have extensive HELP (structured referencing to user control syntax) and tutorial capabilities (structured reference to user control semantics). User entries shall correspond to input formats as defined in appendix IV. User entries shall correspond to input retrieval restrictions as defined in section 3.1.4.3.3.1.4 for logical security. All error responses shall be unambiguous and, when applicable, guide the user in the correct reentry procedures. All interactive response messages shall be brief without negative tones, and constructive in procedurally correcting the user for current and future utilization.

3.1.4.3.3.1.3 Retrieval security. The WMSCR shall provide the capability to limit the data retrieval capabilities for each group of external users. The privileges accorded to each group of external users shall be maintained in an adaptation data base and modified via the control function. For each user, the WMSCR shall be able to apply the following configurable data retrieval limitations:

(a) Limitations by product identification. The WMSCR shall restrict product retrieval to any subset of the dynamic weather product data base.

(b) Limitation by report identification. The WMSCR shall restrict report retrieval to any subset of the dynamic weather and NOTAM report data base(s).

(c) Limitations by request type. The WMSCR shall restrict data retrievals to any subset of the data retrieval language.

(d) Limitations of response text size. The WMSCR shall limit the textual size of the response to a data request to a maximum size. The response shall be truncated beyond the predefined maximum size.

(e) Limitation of number of products or reports. The WMSCR shall limit the data request to a predefined number of products or reports. The response will be truncated beyond this maximum number.

3.1.4.3.3.1.4 Request identification. The WMSCR shall place the request identification field received in the data request ADU into the request identification field of the data response or the data request rejection ADU. This action shall allow requestors to associate the data responses with the original requests.

3.1.4.3.3.1.5 Data response ADU. The WMSCR shall respond to all data requests with data response ADUs, which are defined in Appendix III. Product retrieval requests (WMO, FCM-S2, and "RC") shall result in one data response ADU for each product that satisfies the request criteria. Report retrieval requests, including any "RQ", "RL", or NOTAM requests, shall result in a data response ADU with an unstructured format UPI. The "RC", "RQ", and "RL" and NOTAM request formats are defined in FAA publication 7110.80, Data Communications.

3.1.4.3.3.1.6 Data request reject ADU. If the data request function finds an error in the data request, a data request reject ADU shall be returned to the requestor. The WMSCR shall place a reject code in the ADU that will indicate the problem.

3.1.4.3.3.2 Weather product retrieval functions. The WMSCR shall provide the capabilities for retrieval of WMO formatted products stored in the dynamic weather product data base. The functions are described in Appendix IV and in the following subsections.

3.1.4.3.3.2.1 Specific UPI. The WMSCR shall support a request for a product where the requestor provides all information required to form the UPI.

3.1.4.3.3.2.2 Date/Time-range. The WMSCR shall support the retrieval of one or more products of a specific type between a specific start date/time and a specific end date/time. All versions of that weather product(s) in the dynamic weather product data base within the range shall be returned to the requestor. The WMSCR shall also support a request for all versions of a weather product since a specific date/time or before a specific date/time.

3.1.4.3.3.2.3 Latest version. The WMSCR shall support request for the latest version of the weather product stored in the dynamic weather product data base.

3.1.4.3.3.2.4 Multiple retrieval. The WMSCR shall support a request for a maximum of N versions of a specific product. N shall be a configurable parameter defined within the adaptation data base.

3.1.4.3.3.2.5 Multiple criteria. The WMSCR shall support retrieval requests that combine any of the retrieval criteria defined above.

3.1.4.3.3.3 Weather and NOTAM report retrieval functions. The WMSCR shall provide the capabilities for retrieval of any weather and NOTAM report stored in the dynamic report data base(s). The basic retrieval functions are described in Appendix IV and the following subsections.

3.1.4.3.3.3.1 Specific URI. The WMSCR shall support a request for a weather report identified by a fully defined URI (station, type, and time). When the report type being requested is a surface observation the WMSCR shall respond with any subsequent special amendment or correction including all NOTAM and Pilot reports contained in the dynamic report data base(s) for that specific station.

3.1.4.3.3.3.2 Specific NOTAM URI. The WMSCR shall support a request for a NOTAM report identified by a fully defined URI (station and sequence/version number).

3.1.4.3.3.3.3 Station weather report retrieval. The WMSCR shall support a user requesting all weather reports of any type or time for a specific station. When the report type being requested is a surface observation, the WMSCR shall respond with any subsequent special amendment or correction, including all NOTAM and Pilot reports contained in the report data base(s) for that specific station.

3.1.4.3.3.3.4 Station NOTAM report retrieval. The WMSCR shall support a user request of all NOTAM reports for a specific station.

3.1.4.3.3.3.5 Time-range report retrieval. The WMSCR shall support the retrieval of all weather reports of any type for a specific station between a specific start date/time and a specific end date/time. The WMSCR shall also support a request for all weather reports since a specific date/time. When the weather report type being requested is a surface observation, the WMSCR shall respond with any subsequent special amendment or correction, along with all NOTAM and pilot reports contained in the report data base(s) for that specific station.

3.1.4.3.3.3.6 Latest version weather report retrieval. The WMSCR shall support a request for the latest version of a specific weather report type from a specific station. When the weather report type being requested is a

surface observation, the WMSCR shall respond with any subsequent special amendment or correction, along with all NOTAM and pilot reports contained in the report data base for that specific station.

3.1.4.3.3.3.7 Latest version NOTAM report retrieval. The WMSCR shall support a request for the latest version of a specific NOTAM report for a specific station.

3.1.4.3.3.3.8 Multiple weather and NOTAM report retrieval. The WMSCR shall support a request for a maximum of N versions of a specific report type from a specific station. N shall be a configurable parameter, definable in increments of 1 with a value ranging from 1 to 20 as a minimum, within the adaptation data base. When the report type being requested is a surface observation (excluding WMO surface observations), WMSCR shall respond with any subsequent special amendment or correction, along with all NOTAM and pilot reports contained in the weather and NOTAM report data base(s) for that specific station.

3.1.4.3.3.3.9 Multiple criteria weather and NOTAM report retrieval. The WMSCR shall support retrieval requests that combine any of the retrieval criteria defined above.

3.1.4.3.3.3.10 Station set weather report retrieval. The WMSCR shall support report retrieval requests which specify a predefined set of stations rather than a specific station name. These named sets of stations shall be predefined and created by operator command. This type of request will operate exactly like multiple requests for the same report from multiple stations. However, this type of request will not require appending of NOTAM or pilot reports.

3.1.4.3.3.4 Retrieval users. The WMSCR shall provide the retrieval capabilities described in the previous two sections for each user group. The functional capabilities provided for each user group shall take into account the specific message formats unique to that user group.

3.1.4.3.3.4.1 External users. The WMSCR request/reply capability shall support external users that send in data retrieval requests. It shall be the responsibility of the processing function to recognize incoming data requests and to package these requests into one of the ADU formats defined in Appendix IV, Data Request Formats.

3.1.4.3.3.4.1.1 RWP data requests. The WMSCR shall support data requests from any RWP system. The request formats permitted from the RWP are defined in the NAS-IR-25012507.

3.1.4.3.3.4.1.2 AWP data requests. The WMSCR shall support data request from the collocated AWP. The request formats permitted from the AWP are defined in the NAS-IR-25042507.

3.1.4.3.3.4.1.3 Network user data requests. The existing WMSC data request capability and request reply formats shall be duplicated by the WMSCR system. This capability shall include support of the "RQ", "RC", and "RL" formats. The WMSCR shall also provide the capability for additional, more advanced query features to current users, as defined in Appendix IV. All data request formats are found in Appendix IV.

3.1.4.3.3.4.1.4 Leased Service A System data requests. The capabilities and formats currently used by WMSC Leased Service A System (LSAS); i.e., LABS; users for data request/reply shall be supported by the WMSCR through the Service A System Gateway. These capabilities shall include support of the "RQ", "RC", and "RL" formats. The WMSCR shall also provide the capability for additional, more-advanced features to current users, as defined in Appendix IV.

3.1.4.3.3.4.1.5 Airline user data requests. The existing WMSC airline user data request capability and formats shall be supported by the WMSCR. This capability shall include support of the "RQ", "RC", and "RL" formats. The WMSCR shall also provide the capability for additional, more advanced query features to current users, as defined in Appendix IV.

3.1.4.3.3.4.1.6 Message switch network user data requests. The WMSCR shall support data requests from subscribers connected to the NADIN 1A message switch, excluding AFTN subscribers. This capability shall include support of the "RQ", "RC", and "RL", formats. The WMSCR shall also provide the capability for additional more advanced query features as defined in Appendix IV.

3.1.4.3.3.4.1.7 WCP data requests. The WMSCR shall support data request from any WCP. The request formats permitted from the WCP are defined in NAS-IR-25072503, WMSCR/WCP IRD.

3.1.4.3.3.4.1.8 CNSP data requests. The WMSCR shall support data requests from the CNSP. The WMSCR shall support data requests addressed to the CNSP. The request formats permitted from the CNSP are defined NAS-IR-25072505.

3.1.4.3.3.4.1.9 TMP data requests. The WMSCR shall support data requests from TMP. The request formats permitted from the TMP are defined in NAS-IR-25072401, WMSCR/TMP IRD.

3.1.4.3.3.4.2 Internal retrieval.

3.1.4.3.3.4.2.1 Data retrieval by internal data assembly. The product assembly function (refer to section 3.1.4.2.5) shall be able to retrieve products and reports from the weather and NOTAM data base(s).

3.1.4.3.3.4.2.2 Operator data retrieval. The WMSCR operator shall have a full repertoire of data retrieval commands (refer to sections 3.1.4.4.2.2.3.2.2.3 and 3.1.4.4.2.2.3.2.2.4).

3.1.4.3.4 Data deletion. The WMSCR shall delete obsolete data from the dynamic weather and NOTAM data base(s). Weather product and report data shall be deleted automatically, based on configurable parameters. NOTAM report data shall be deleted based on an explicit NOTAM cancellation report for each specific NOTAM received from the CNSP.

3.1.4.3.4.1 Product deletion. The WMSCR shall automatically delete obsolete weather products from the WMSCR dynamic weather product data base. The retention period for each weather product is found in the PIDB. The retention period is the number of hours after the observation or validation that the weather product will be kept on the dynamic weather product data base. The actual life-span of the product on the dynamic weather product data base is a function of the weather products receipt time and its respective retention period.

3.1.4.3.4.2 Weather Report deletion. The WMSCR shall automatically delete obsolete weather reports from the dynamic weather report data base. The retention period for each report is the retention period for each report type by station in the SIDB. The WMSCR shall maintain these default retention periods in an adaptation data base that is modifiable by operator command. The retention period is the number of hours after date time contained in the fully defined URI, that the report is retained in the report data base. The actual life-span of the report in the report data base is a function of the report receipt time and its respective retention period.

3.1.4.3.4.3 NOTAM report deletion. The WMSCR shall not automatically delete NOTAM reports from the dynamic NOTAM report data base based on a scheduled retention period. The WMSCR shall maintain NOTAM reports in the dynamic NOTAM report data base until an explicit NOTAM cancellation report for each specific NOTAM is received from the CNSP. NOTAM report retention time is not a function of report receival time.

3.1.4.3.4.4 Communications data storage deletion. Any weather product residing in communications data storage beyond the product retention period shall be automatically deleted. Further, WMSCR shall delete any weather product that has resided in communications data storage longer than the storage retention limit (3.1.4.1.2.6). Any weather product or weather or NOTAM report which cannot be delivered by the communications function (and for the case of weather, does not exceed its respective retention period) shall be automatically requeued for transmission.

3.1.4.3.5 System journal. The WMSCR shall maintain an on-line journal of all system activity for a period of 24 hours. The WMSCR shall provide the capability to transfer this information to off-line media for permanent storage. The journal function shall also include the capability to produce on-line and off-line reports.

3.1.4.3.5.1 Journal contents. The journal shall contain, at a minimum, the following data:

(a) The complete text or contents of all data received from an external source or generated internally by product assembly or data retrieval.

(b) The size of each product/report.

(c) The date and time of reception or internal assembly.

(d) A record of data transmitted shall include the destination, date and time, and output sequence number (if any).

(e) A complete record of all updates to the dynamic product or report data base(s) (report text, full URI, and time of update).

(f) A record of all data deletions from the dynamic product or report data base(s) including time of deletion and deleting agent (operator, automatic, or CNSP initiated).

(g) A record of all request reply transactions and responses, including requestor and time of request.

(h) A record of all events recorded on the system event log (refer to section 3.1.4.4.1.4).

(i) Hourly summaries of all statistics maintained by the system (refer to 3.1.4.4.1.5).

(j) A record of all operator-entered commands and system responses.

(k) A record of all editing activities performed, including the text of the corrected message.

3.1.4.3.5.2 Journal transfer. The WMSCR shall provide the ability to transfer the on-line journal to off-line storage. Storage resource requirements shall be such that the frequency of this function shall be a configurable parameter of 1 to 24 hours.

3.1.4.3.5.3 Journal utility functions. The WMSCR shall provide on-line and off-line utility functions to extract, format and organize, and print the respective journal information.

3.1.4.3.5.3.1 Selective product printing. The WMSCR shall provide the capability to select and print all products that satisfy operator-entered request criteria. The printout shall include the weather product text, weather product size, arrival time, source, destination(s), and purge time. The selection criteria shall consist of:

(a) N Weather product source or destinations, where N shall be a configurable parameter, definable in increments of 1 with a value ranging from 1 to 20 as a minimum.

(b) N Full or partially qualified UPI weather product identification(s), where N shall be a configurable parameter, definable in increments of 1 with a value ranging from 1 to 20, as a minimum.

(c) N Time range, where N shall be a configurable parameter, definable in increments of 5 minutes with values ranging from 5 to 1440 minutes.

3.1.4.3.5.3.2 Selective report printing. The WMSCR shall provide the capability to be able to select and print all reports that satisfy operator-entered request criteria. The print-out shall include the station identifier report text, report size, source, associated product identification (if any), arrival time and purge time. The selection criteria shall consist of:

(a) N Weather or NOTAM reporting stations, where N shall be a configurable parameter, definable in increments of 1 with a value ranging from 1 to 20, as a minimum.

(b) N Weather or NOTAM report types, where N shall be a configurable parameter, definable in increments of 1 with a value ranging from 1 to 20, as a minimum.

(c) N Weather or NOTAM time range, where N shall be a configurable parameter, definable in increments of 5 minutes with values ranging from 5 to 1440 minutes.

Where N shall be a configurable parameter defined in the adaptation data base.

3.1.4.3.5.3.3 Selective system event-log printing. The WMSCR shall provide the capability to select and print all event-log entries that satisfy operator-entered request criteria. See 3.1.4.4.1.4 for a description of the system event log. The selection criteria shall consist of:

(a) Date/time range.

(b) Event priority.

(c) Event code.

This feature shall also permit the printout of all operator commands that are recorded on the system event log. This printout can be further limited to commands of a certain type or by a specific operator or group of operators.

3.1.4.3.5.3.4 Traffic analysis. The WMSCR shall provide the capability to produce the following from data contained in the journal:

(a) Hour-by-hour summaries of product types received and transmitted.

(b) Hour-by-hour summaries of reports received.

(c) Request/reply data received, and responses to request/reply data transmitted for any specific or all external interfaces.

The WMSCR shall also permit the operator to request a summary containing a subset of the total traffic. The selection criteria shall consist of:

(a) Interface or set of interfaces.

(b) Time range.

3.1.4.3.5.3.5 Data analysis. From data in the journal, the WMSCR shall provide the capability to produce a summary report of data reception information grouped by data type for any or all external interfaces. It shall be possible to restrict the journal report to specific data types and time ranges.

This summary report shall consist of:

(a) Number of each report and/or product.

(b) Average size of each report and/or product.

(c) Statistical distribution of each report and/or product by a configurable time interval.

3.1.4.3.5.3.6 System performance analysis. From data in the journal, the WMSCR shall provide the capability to produce reports showing the utilization of WMSCR system resources.

3.1.4.3.5.3.7 Reporting station history. The WMSCR shall provide the capability to produce a "reporting station history" report for a specified station from data contained in the journal. This report shall contain the following:

(a) arrival time of each report received from the station.

(b) size of each report received from the station.

(c) number of reports of each type received from the station.

(d) total number of reports received from the station.

The selection criteria shall consist of a station identifier, a start date time, and an end date time.

3.1.4.3.6 Data storage and retrieval performance requirements.

3.1.4.3.6.1 Product storage. The storage function shall store data classified as a product at the following rate:

(a) Storage in dynamic area within 10 seconds, 50 percent of the time.

(b) Storage in dynamic area within 20 seconds, 95 percent of the time.

This data storage function shall take place after the completion of the data identification and validation functions.

3.1.4.3.6.2 Report storage. The storage function shall store data classified as a report at the following rate:

(a) Reports shall be stored in the dynamic area within 10 seconds, 50 percent of the time.

(b) Reports shall be stored in the dynamic area within 20 seconds, 95 percent of the time.

This data storage function shall take place after the completion of the data identification and validation functions.

3.1.4.3.6.3 Data retrieval. The performance of the WMSCR data capability shall be measured while the WMSCR is concurrently processing the data defined in Appendix I, System Traffic Throughput Test Data Set. Performance requirements shall apply to both control terminal retrieval and external user retrieval. The WMSCR shall meet the performance response requirements as measured from the time the last character of the request is received until the last character of the response is queued for transmission.

3.1.4.3.6.3.1 Product retrieval performance. The WMSCR shall execute a data request for the latest version of a given product in either of the following formats:

WMO TTAAii CCCC

RC TTAAii CCCC

with a response time of A seconds, 50 percent of the time, and a response time of B seconds, 95 percent of the time, where:

A = 2.5 + 0.002 (product size in bytes)

B = 15.0 + 0.005 (product size in bytes)

This performance assumes a randomness in the product identification (TTAAiiCCCC) and assumes that a product is present for retrieval in all cases.

3.1.4.3.6.3.2 Report retrieval performance. The WMSCR shall execute a data request for a report from five stations in either of the following formats:

Report SA SSS1, SSS2, SSS3, SSS4, SSS5

RQ SSS1 SA SSS2 SA SSS3 SA SSS4 SA SSS5 SA

with a response time of C seconds, 50 percent of the time, and a response time of D seconds, 95 percent of the time, where:

C = 5.0 + 0.002 (sum of report sizes in bytes)

D = 20.0 + 0.005 (sum of report sizes in bytes)

This performance assumes a randomness in the selection of the five observing stations (SSSn) and that a report is present for retrieval in all cases.

3.1.4.3.6.4 Weather data deletion. The WMSCR shall delete weather products and reports within five minutes after the specified purge time.

3.1.4.3.6.5 NOTAM data deletion. The WMSCR shall replace NOTAM reports within 30 seconds after a NOTAM file is received from the CNSP.

3.1.4.4 Control function. The control function shall consist of two parts as shown in Figure 9:

(a) Automatic system control.

(b) Operator control.

3.1.4.4.1 Automatic system control. The WMSCR shall operate largely without operator intervention with the exception of such functions as message-error correction. To control the automated operation, WMSCR shall access and use information in adaptation data bases (NCDB, PIDB, PADB, etc.). Figure 9 shows how the adaptation data bases are updated by the operator control function to control the automatic operation of the major system elements. In addition, each WMSCR node shall exchange coordinating information with the other node to determine system status. Figure 9 shows the system event logging function where system events are recorded for review by the operators.

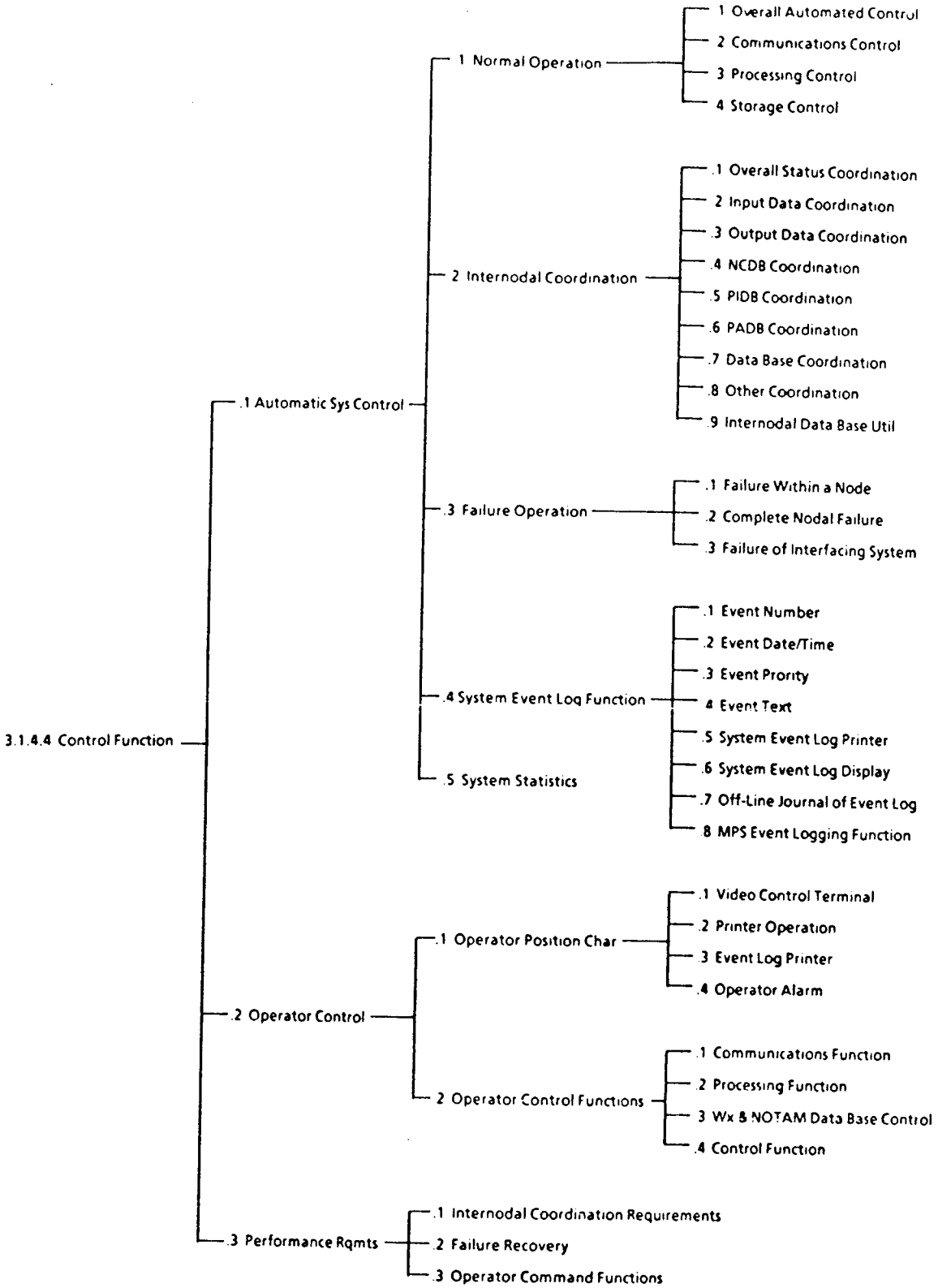

Figure 8. Organization of Section 3.1.4.4, Control Function

3.1.4.4.1.1 Normal operation. Each WMSCR node shall normally be responsible for serving subscribers located in one geographical half of the country. Each subscriber (except for the NWSTG) will be connected by the NADIN II PSN or by a direct link to only one node. The NWSTG has links to both nodes via the NWID. Any data received at only one node shall routinely be sent to the other node via the WMSCR internodal link. Subscriber data requests shall be sent only to the attached node that will respond with the requested data. Each WMSCR node shall be capable of and ready to assume responsibility for the entire network if the other node fails.

3.1.4.4.1.1.1 Overall automated control. The WMSCR shall monitor the status of all system elements. If a failure is detected in any element the WMSCR shall automatically execute an appropriate action to substitute a redundant element or switch to a backup mode of operation. Part of the overall control strategy is the exchange of status information between the nodes.

3.1.4.4.1.1.2 Communications control. The communications function shall be controlled by information in the NCDB. The WMSCR shall automatically detect failures in any of the interfaces and devise a strategy to best circumvent the problem, as discussed in the failure scenarios for external systems in 3.1.4.4.1.3.3.

3.1.4.4.1.1.3 Processing control. Automatic operation of the processing function shall be controlled by information in the PIDB and the PADB.

3.1.4.4.1.1.4 Storage control. Automatic operation of the storage function shall be controlled by information in the static data bases and by other adaptation data bases defined in 3.1.4.3.

3.1.4.4.1.2 Internodal coordination. The two WMSCR nodes shall exchange weather, NOTAM, and coordination information over the WMSCR internodal link. The WMSCR shall ensure consistency between the operational status, configuration status, and data base status of both nodes. The WMSCR shall ensure that the operator at one node will be informed about the actions of the operator at the other node as they relate to control and system configurations.

3.1.4.4.1.2.1 Overall status coordination. The WMSCR shall exchange coordination information defining the overall status of each node. The frequency of this exchange shall be a system configuration parameter and shall be selectable in increments of 1-second, ranging from 1 to 255 seconds.

3.1.4.4.1.2.2 Input data coordination. The WMSCR shall ensure that data received and stored at one node is also received and stored at the other node.

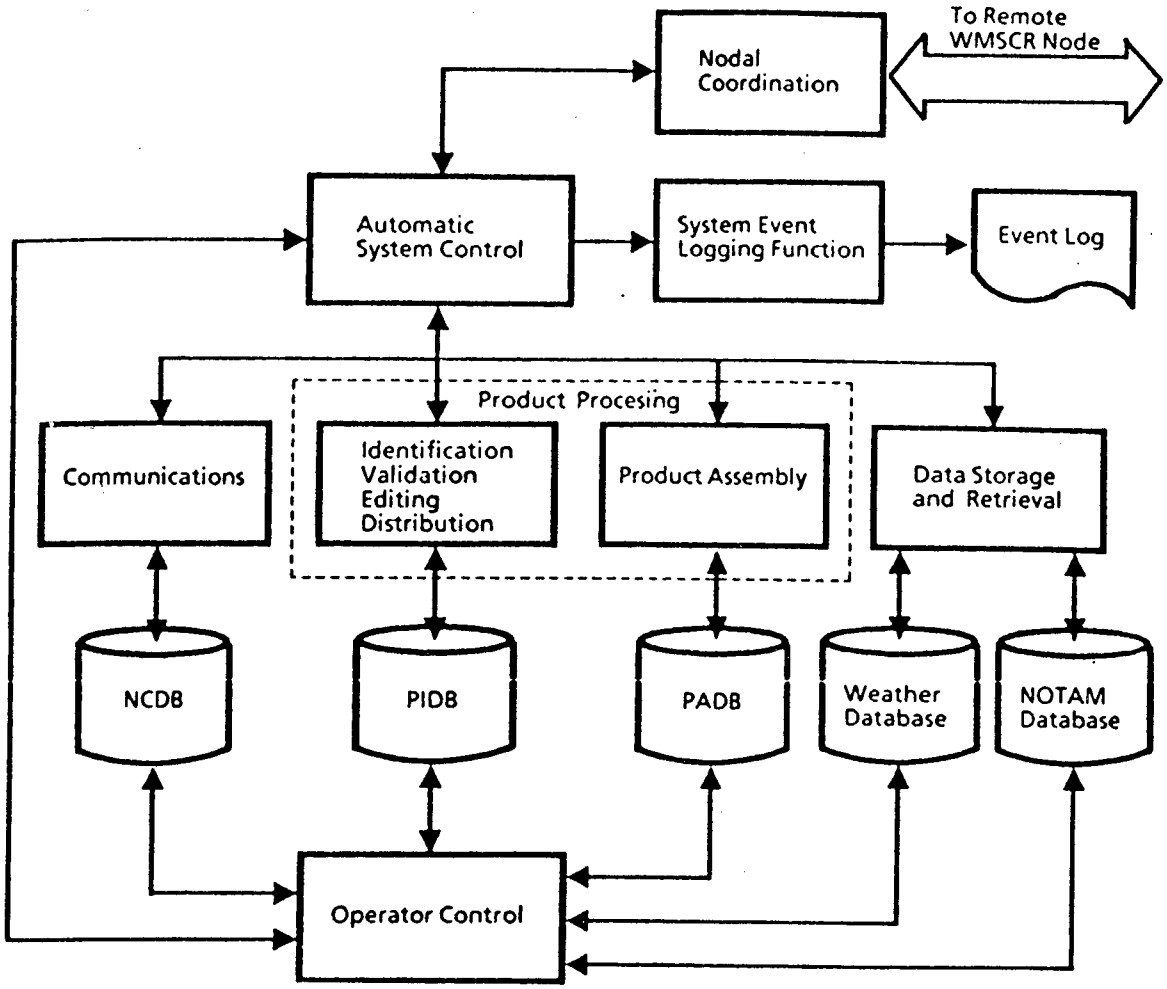

Figure 9. Functional Flow within the Control Function

interval shall be dependent upon product priority as defined in the PIDB. The exact value assigned to each priority level shall be a system configuration parameter definable in 1-second increments with a value ranging from 1 to 255 seconds.

3.1.4.4.1.2.3 Output data coordination. The WMSCR shall exchange coordination information between the nodes to ensure that a product successfully transmitted by one node will not be retransmitted by the other node in the case of a nodal transfer, provided that the coordination information has been successfully exchanged prior to the transfer. Conversely, the surviving node shall also ensure that all products for which no output coordination information have been received will be transmitted following a system switchover.

3.1.4.4.1.2.4 NCDB coordination. The WMSCR nodes shall exchange information concerning the configuration and operational status of the NCDB of each node. Whenever an operator command changes the communications configuration, the WMSCR shall send coordination information that shall be used by the remote node to make the corresponding change to its NCDB. The WMSCR shall use coordination information to ensure that changes in operational status of any circuit due to line failure or errors will be reflected in the status at the other node.

3.1.4.4.1.2.5 PIDB coordination. The WMSCR shall ensure that the PIDB information at the two nodes is consistent. The WMSCR shall exchange coordination information whenever an update is made to the PIDB either automatically or as a result of an operator command. This coordination information shall be used to make the corresponding change to the PIDB at the other node.

3.1.4.4.1.2.6 PADB coordination. The WMSCR shall ensure that the PADB information at the two nodes will be consistent. The WMSCR shall exchange coordination information whenever an update is made to the PADB either automatically or as a result of an operator command. This coordination information shall be used to make the corresponding change to the PADB at the other node.

3.1.4.4.1.2.7 Data base coordination. The WMSCR shall ensure that the static data base(s) at the two nodes will be consistent. The WMSCR shall exchange coordination information whenever an update is made to a static data base either automatically or as a result of an operator command. This coordination information shall be used to make the corresponding change at the other node. The dynamic data base(s) shall be identical as a result of the input data coordination function.

3.1.4.4.1.2.8 Other coordination. The WMSCR shall ensure consistency between the nodes of all other operational functions and data bases not specifically identified in the preceding sections.

3.1.4.4.1.2.9 Internodal data base Utility. The WMSCR shall have the capability to transfer any or all elements of the data base at one node to the data base of the other node. After the failure of one node, this capability will be used to replenish the data base from the surviving node. This utility shall perform three major functions:

(a) Dynamic data base replenishment

(b) Dynamic data base comparison

(c) Static and Adaptation data base comparison and replenishment

3.1.4.4.1.2.9.1 Dynamic data base replenishment. The WMSCR shall have the capability to transfer over the internodal link weather and NOTAM data from one node to the other. Only data missing from the receiving node's data base shall be transferred. Products shall be transferred in product priority order as determined by the PIDB.

3.1.4.4.1.2.9.2 Dynamic data base comparison. The WMSCR shall have the capability to compare the dynamic data base(s) of each node and prepare a report listing the differences between the two nodes. This function shall not interfere with and shall operate at a lower priority than other users of the internodal link. In the case where one node is down and the other is not this function shall cease. Upon restart of malfunctioning node this function shall begin again.

3.1.4.4.1.2.9.3 Static and adaptation data base replenishment. The WMSCR shall permit the transfer of the static data base(s), the NCDB, the PIDB, the PADB, and all other support data bases from one node to the other via the internodal link.

3.1.4.4.1.3 Failure operation. The requirement for nodal reliability as defined in 3.4 shall govern the requirements concerning WMSCR failure operation. To the extent that the following sections are relevant to a proposed solution, the requirements defined in the subsection below must also be met. The WMSCR shall report all failures to the operator on the system event log, as defined in 3.1.4.4.1.4. Figure 10 is a diagram depicting various states encountered during failure of WMSCR components.

(a) In the absence of any failure conditions, the WMSCR system shall be in the Normal Operating Mode (refer to section 3.1.4.4.1.1), and a node shall be in the Primary State (operating on primary equipment).

(b) If a critical system components fails, the node shall attempt to continue normal mode operation on backup equipment (if any) and shall be placed in the Backup State (operating on backup equipment). If the failed component(s) is restored, the WMSCR node returns to the Primary State.

(c) Should failures occur to the point where no backup equipment is available, the node shall be in the Failed State (primary and backup equipment failed). In this state, the WMSCR functions are not being performed and the WMSCR subscribers are not being served

by the failed node. The WMSCR system is in the Degraded Operating Mode. Should the component be restored within 3 seconds, the node shall return to the Backup State.

(d) If the failed equipment has no further backup, then the responsibilities of this node shall be transferred to the other node. This transfer shall occur automatically or in some cases (defined following) shall require an operator decision. This shall be called the Transferred State (functions transferred to remote node) for the failed node and the Single-Node State (dual-function operation) for the remote node. In this state, all functions normally performed by both nodes shall be performed by the one surviving node. In the Single-Node State, all performance requirements stated in this specification will be relaxed by 10 percent.

(e) When the failed equipment is restored, the failed node enters the Recovery State (data base recovery) and the surviving node enters the Recovery Support State (data base recovery support). In these states, the two WMSCR nodes shall cooperate to bring the failed system to a point of readiness to resume its normal functions. When the failed node is ready, it shall return to Primary State or Backup State (depending on the backup equipment available) and the WMSCR system shall be returned to the Normal Operating Mode.

(f) If both nodes enter the failed state simultaneously, service to the users will be interrupted.

3.1.4.4.1.3.1 Failure within a node. The WMSCR shall automatically detect errors within the WMSCR system elements. If a node has the inherent reliability to achieve the required nodal availability without redundancy, then any failure implies a transfer to the Switched State for the failed node and Single-Node State for the surviving node.

3.1.4.4.1.3.1.1 Software failure. The WMSCR shall monitor the operation of all critical software elements and detect the software failure of any such element. A critical software element is one required for the operation of the on-line portions of the communications, processing, weather and NOTAM data base(s) storage and retrieval, and control functions. The WMSCR shall immediately and automatically attempt to restart the failed element at the time of detection of a failure. The WMSCR shall not attempt restart of a software element after the third consecutive failure of the same element within an adaptable time interval. In this case, the node shall revert to redundant system elements (if any). If software recovery is not successful, the operator shall be notified of the problem and, if possible, the WMSCR software shall restart without the failing element. Should a software problem prevent a coherent action by the primary or redundant equipment, the procedures for total nodal failure shall be followed.

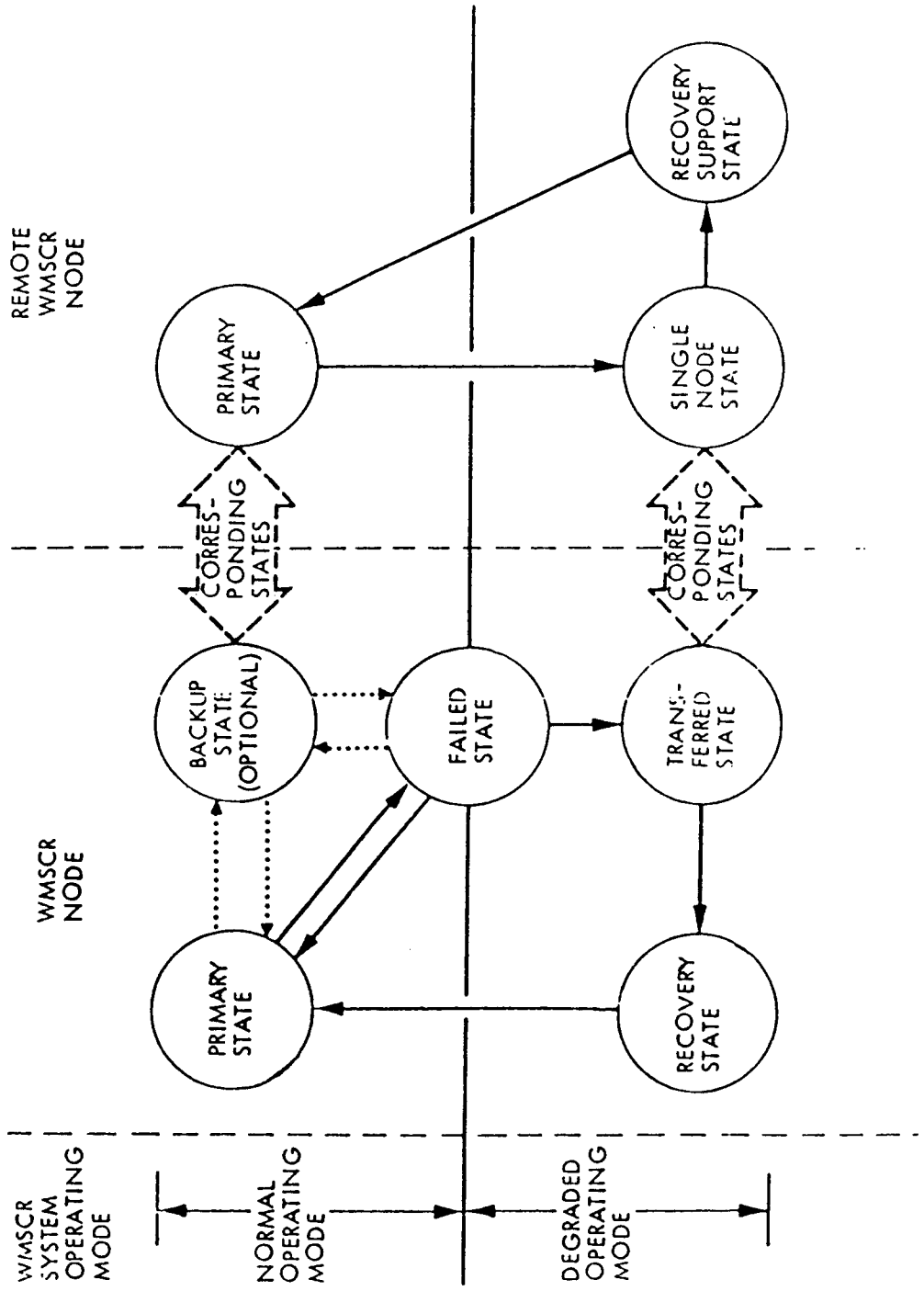

Figure 10. The WMSCR Mode and State Diagram

3.1.4.4.1.3.1.2 Hardware failure. Hardware failure shall be detected and appropriate automated action taken by the surviving equipment. If redundant hardware exists, it shall be automatically substituted. This hardware reconfiguration shall require no more than 10 seconds after failure detection. The disruption to subscribers shall be limited to the 10 seconds of unavailability. All incoming data shall be recoverable through normal interface error recovery procedures. The duplication of output data limited to the data element in progress at the time of failure shall be permitted. If redundant equipment is not available and if the failed item is critical to the functioning of the node, then the nodal switchover procedures shall be followed.

3.1.4.4.1.3.1.2.1 Critical equipment. The WMSCR critical equipment shall consist of the central processing unit, the communications equipment supporting the synchronous interfaces to the NADIN PSN, NWID, the primary and the secondary storage device, and the interface supporting at least one operator position. The total failure of any of these hardware elements at a node shall result in an automated switchover to the other WMSCR node. If backup equipment is provided to achieve the nodal availability requirement, then an automatic reconfiguration capability shall be required within 10 seconds after failure detection.

3.1.4.4.1.3.1.2.2 Non-Critical equipment. The balance of the equipment at a node is deemed non-critical. The WMSCR nodal operation shall continue in spite of the failure of magnetic storage media, control positions, and printers. The detection of the failure of non-critical equipment, just as for critical equipment, shall be automatic. If backup equipment is provided for non-critical items, the reconfiguration process to use this equipment may be manual.

3.1.4.4.1.3.1.3 Electrical and environmental equipment failure. The WMSCR shall survive power interruptions of up to two minutes with no loss of volatile memory. During this period, an interruption of service to subscribers is permitted. Upon power restoration, the failed WMSCR node shall perform nodal restoration procedures in accordance with 3.1.4.4.1.3.2.3. No loss of data shall occur on error-checked input circuits. No duplication of delivered products whose acknowledgements were received by WMSCR shall occur on output circuits. The WMSCR shall survive the loss of environmental conditioning for a minimum of 20 minutes.

3.1.4.4.1.3.2 Complete nodal failure. The WMSCR shall continue to operate with only one node available with no loss of functionality to any subscriber. After a nodal failure, the surviving node shall establish connections to all subscribers served by the failed node. Based on information in the data base kept current by the exchange of coordination messages, the surviving WMSCR node shall reestablish the contents of communications data storage for each of the transferred subscribers. When operating in the single node state, all performance criteria specified herein shall be relaxed by no more than 10 percent.

3.1.4.4.1.3.2.1 Failure detection and notification. Total nodal failure detection shall be automatic. A total nodal failure shall cause the remote node to be automatically notified of the problem via the internodal link. The failed WMSCR node shall assume a non-operating status in which it will not interfere in any way with the surviving node which shall assume a degraded operating mode and thus a single node state.

3.1.4.4.1.3.2.2 Nodal Switchover. Each of the following conditions shall initiate a nodal switchover:

(a) When a total nodal failure is detected at one node and communicated across the internodal link to the other node, the surviving node shall automatically reconfigure itself to assume responsibility for all system functions.

(b) When the operator at one node specifically enters a command that switches operational control of the network served by the local WMSCR to the remote node, the switchover request shall be transmitted across the internodal link as in (a) with the same result.

(c) When following a nodal failure without automatic internodal notification, the operator of the surviving node manually assumes control of the entire network. In this case, automatic switchover is not required.

3.1.4.4.1.3.2.3 Nodal restoration. The WMSCR shall automatically begin orderly resumption of operation at a failed node following restoration of the failed element. The following three functions shall be performed:

(a) The dynamic data base shall be restored to a complete status through both the receipt of data on directly attached input interfaces (e.g., the NWS), and by the execution of the internodal data base utility (3.1.4.4.1.2.9).

(b) All outstanding coordination messages shall be fully processed.

(c) Connections to all subscribers shall be reestablished after the data base has been restored.

3.1.4.4.1.3.2.4 Data integrity requirements. The WMSCR shall ensure data integrity. Data integrity under failure conditions are defined below.

(a) In the absence of a critical system component failure no data shall be lost.

(b) In the event of the failure of an error-checked communication interface, no loss of data on that interface shall be permitted (assuming the corresponding system also makes provision for the data storage and retransmission in cases of interface failure).

(c) Any incoming data received and successfully stored on communications data storage shall not be lost in the event of a system failure. All weather data shall be stored within 0.5 seconds of validation. All processed NOTAM data shall be stored within 0.5 seconds of validation.

(d) No more than one message per logical output interface shall be subject to duplicate retransmission in the event of a system failure.

(e) In the event of the total failure of a node (and the transfer of subscribers to the remote node), the remote node shall only be responsible for data which it has successfully received and stored. Likewise, the remote node shall prevent against duplicate transmission of only that data for which output coordination messages have been received.

3.1.4.4.1.3.3 Failure of interfacing systems. The WMSCR shall react to an interface failure in a manner consistent with the interface type as defined below.

3.1.4.4.1.3.3.1 NADIN PSN failure. A failure that causes complete isolation of a WMSCR node from the NADIN PSN shall cause nodal failure procedures to be executed, with the exception that the node will continue to receive data from the NWSTG and the other WMSCR node. The WMSCR shall continue to support the collocated AWP.

3.1.4.4.1.3.3.2 NWSTG failure. A total NWSTG failure will not affect nodal operation. Pre-specified forecast data will be received from the NSSFC by one WMSCR node rather than the NWSTG. This data from the NSSFC shall be forwarded to the other node over the internodal link. Data for the NWSTG shall be retained in communications data storage. If a link from the NWID to a single WMSCR node fails, NWSTG data received at the other node shall be forwarded to the isolated node over the WMSCR internodal link. Likewise, data from the isolated node for the NWSTG shall be sent over the internodal link to be forwarded to the NWSTG.

3.1.4.4.1.3.3.3 WMSCR internodal link failure. If the WMSCR internodal link fails, one node which will be chosen by the FAA, shall assume the responsibility for the entire NAS. The WMSCR shall operate in the degradated mode.

3.1.4.4.1.3.3.4 RWP failure. The failure of a RWP shall cause the WMSCR to retain the data for that RWP in communications data storage.

3.1.4.4.1.3.3.5 AWP failure. The failure of the AWP shall cause the WMSCR to retain the data in communications data storage.

3.1.4.4.1.3.3.6 CNSP failure. The failure of the CNSP will not affect the operation of the WMSCR except for the loss of NOTAM data normally received from the CNSP. The failure of the CNSP shall cause the WMSCR to retain the data in communications data storage.

3.1.4.4.1.3.3.7 ADAS failure. The failure of an ADAS shall not affect WMSCR operation except for the loss of data normally received from the failed unit.

3.1.4.4.1.3.3.8 Message switch gateway failure. The failure of a message switch gateway shall not impact the WMSCR because the NADIN PSN will automatically route all connections to the backup gateway.

3.1.4.4.1.3.3.9 Carswell (KAWN) failure. The failure of the Carswell system shall cause the WMSCR to retain the data for Carswell in the communications data storage.

3.1.4.4.1.3.3.10 Airline packet network user failure. The failure of an airline packet network user shall cause the WMSCR to retain the data in communications data storage.

3.1.4.4.1.3.3.11 Asynchronous subscriber failure. The failure of an asynchronous subscriber will not be detected by WMSCR.

3.1.4.4.1.3.3.12 Leased Service A System failure. The failure of a SAS subscriber shall cause the WMSCR to retain the data in communications data storage.

3.1.4.4.1.3.3.13 National Severe Storm Forecast Center (NSSFC) failure. The failure of the NSSFC or the link between the NSSFC and WMSCR shall cause the WMSCR to retain the data in communications data storage.

3.1.4.4.1.3.3.14 WCP failure. The failure of a WCP shall cause the WMSCR to retain the data for the WCP in the communications data storage.

3.1.4.4.1.3.3.15 Maintenance Processor Subsystem (MPS) failure. The failure of the MPS shall cause the WMSCR to retain the data for the MPS in the communications data storage.

3.1.4.4.1.3.3.16 TMP failure. The failure of TMP shall cause the WMSCR to retain the data for the TMP in the communications data storage.

3.1.4.4.1.4 System event logging function. The WMSCR shall have a centralized on-line event recording and display capability. All WMSCR processing modules shall issue notices to the system event logging function describing significant events, their importance, and the time of occurrence. The event notice shall consist of the following fields:

(a) Event number (cyclical code identifying the event).

(b) Event date/time.

(c) Event priority.

(d) Descriptive text.

3.1.4.4.1.4.1 Event number. The WMSCR shall cyclically number each event notice. The event number shall be four digits in length, and automatically reset once every 24 hours.

3.1.4.4.1.4.2 Event date/time. The WMSCR shall automatically generate and append the current date and time to each event notice. The event date shall consist of the current day and month, and the time shall consist of the hour, minute, and second that the notice was generated.

3.1.4.4.1.4.3 Event priority. The WMSCR shall classify event notices as having one of four degrees of importance, as described below. The assignment of priorities to specific events shall be made at the time of implementation.

(a) Critical Event. An event notification that requires immediate action by the operator. A critical event notice shall cause an audible alarm to sound. A critical event notification shall also require a specific operator acknowledgement.

(b) Urgent Event. An event notification that requires action by the operator.

(c) Important Event. An event notification that requires the operators attention, but does not require operator action.

(d) Routine Event. An event notification that advises the operator of the occurrence of a scheduled event.

3.1.4.4.1.4.4 Event notice text. The WMSCR shall display all event notices in descriptive text which fully describes the event being reported.

3.1.4.4.1.4.5 System event log printer. The WMSCR shall display all event notices on a system event log printer. Critical and urgent notices shall be visibly prominent.

3.1.4.4.1.4.6 System event log display. The WMSCR shall record all events to an system event log file on secondary storage. The event log file shall be retained on-line for at least 24 hours. The WMSCR shall provide the capability to use the command terminal for review of events that have been recorded on the WMSCR event log.

3.1.4.4.1.4.7 Off-line journal of system event log. The WMSCR shall provide the capability for all system events to be written to off-line storage in the system journal. This shall be accomplished at least once every 24 hours.

3.1.4.4.1.4.8 MPS event logging function. The WMSCR shall provide the capability for all critical and urgent system event notifications to be written to an on-line MPS storage file. These event notifications shall be retained until transmitted to and acknowledged by the MPS.

3.1.4.4.1.5 System statistics. The WMSCR shall maintain the statistics listed in items (a) through (e) below. The WMSCR shall provide the following ranges for the statistics listed in items (a) through (e):

CU - Single value with the current (last five minute interval) value.
ST - 12 five minute values covering last hour of operation.
HR - Single value covering last 60 minutes of operation.
LT - 24 hour values covering last day of operation.
DY - Single value covering last 24 hours of operation.

The WMSCR shall provide on-line display of any combination of ranges for each statistic. The ranges to be displayed shall be assignable by system manager command. The initial default ranges that shall be displayed for the statistics are indicated in parantheses as follows:

(a) Overall system statistics:

CPU utilization (ST,LT,HR,DY);
Secondary storage utilization (ST,LT,HR,DY);
Memory utilization (ST,LT,HR,DY);
Channel utilization (ST,LT,HR,DY);
I/O wait time (ST,LT,HR,DY).

(b) Communications statistics:

Physical interface number of bytes sent (ST,LT,HR,DY);
Physical interface number of bytes received (ST,LT,HR,DY);
Physical interface number of errors (ST,LT,HR,DY);
Physical channel utilization (ST,LT,DY);
Physical channel percent of time channel up (ST,LT,HR);
Logical channel number of bytes sent (ST,LT,HR,DY);
Logical channel number of bytes received (ST,LT,HR,DY);
Logical channel number of messages (CU,ST,LT,HR,DY);
Logical channel average message size (HR,DY);
Logical channel number of connections made (CU,ST,LT,HR);
Logical channel number of errors (CU,ST,LT,HR);
Communication data storage backlog for each partition (CU,ST,LT);
Average communications data storage in use (ST,HR,DY);
Average communications data storage available (ST,HR,DY).

(c) Data processing statistics:

Number of weather products received (ST,LT,HR,DY);
Number of weather reports stored (ST,LT,HR,DY);
Number of weather reports in error (ST,LT,HR,DY);
Number of weather products transmitted (ST,LT,HR,DY);
Average time for weather product distribution (HR,DY);
Number of weather products distributed (ST,LT,HR,DY);
Number of weather products stored (ST,LT,HR,DY);
Average time to store products (HR,DY);
Average time to break down and store weather reports (HR,DY);
Number of weather products in error (ST,LT,HR,DY);
Number of errors corrected (ST,LT,HR,DY);
Average time to correct error (HR,DY);
Number of products assembled (ST,LT,HR,DY);

Average delay in scheduled product assembly (HR,DY);
Average delay in triggered product assembly (HR,DY);
Number of weather products retrieved for product assembly (ST,LT,HR,DY);
Number of weather reports retrieved for product assembly (ST,LT,HR,DY);
Number of raw NOTAM reports received (LT,HR,DY);
Number of processed NOTAM reports received (LT,HR,DY);
Number of processed NOTAM reports stored (LT,HR,DY);
Number of raw NOTAM reports transmitted (LT,HR,DY);
Average time for processed NOTAM reports distribution (HR,DY);
Number of processed NOTAM reports distributed (LT,HR,DY);
Average size of processed NOTAM reports distributed (HR,DY);
Number of processed NOTAM reports retrieved for product assembly (LT,HR,DY).

(d) Data base storage and retrieval statistics:

Total number of products stored in the product data base(s) (CU);
Total number of reports stored in the report data base(s) (CU);
Number of bytes stored in the product data base (HR,LT);
Number of products purged from product data base (HR,LT);
Total number of bytes stored in product data base (CU);
Number of bytes purged from product data base (HR,LT);
Number of bytes stored in report data base(s) (HR,LT);
Number of reports purged from report data base (HR,LT);
Total number of bytes stored in report data base (CU);
Number of bytes purged from report data base(s) (HR,LT);
Number of weather data requests (HR,LT);
Number of NOTAM data requests (HR,LT);
Average time to respond to weather data request (HR,DY);
Average time to respond to NOTAM data request (HR,DY);
Number of products requested (HR,LT);
Number of reports requested (HR,LT);
Average number of products per request (HR,DY);
Average number of reports per request (HR,DY).

(e) System control statistics:

Number of operator commands of each type (HR,DY);
Number of internodal coordination messages (CU,ST,LT,HR,DY).

3.1.4.4.1.5.1 System statistics for MPS. The WMSCR shall maintain statistics at each node concerning processor utilization and physical communication interfaces. These statics shall cover the operation of the system since the last query by the MPS. The WMSCR shall maintain the statistics listed below for the MPS.

(a) Overall system statics

CPU utilization
I/O wait time

(b) Communications statics

Physical channel utilization
Physical channel failure

3.1.4.4.2 Operator control. This section defines the characteristics of the operator position and defines operator control functions, operational requirements, and the functional requirements of the operator control language. Subsection 3.3 describes the hardware characteristics of the control position.

3.1.4.4.2.1 Operator position characteristics. Each WMSCR node shall have four operator control positions and shall permit an expansion to 16 operator control positions. Each operator control position shall be capable of performing all command functions however, these shall be restricted, as defined in 3.1.4.4.2.1.1.3. An operator control position shall consist of a video control terminal, keyboard and an associated hard-copy printer.

3.1.4.4.2.1.1 Video control terminal. The video control terminal shall provide the capability for interactive conversation with the operator and for full-screen editing. The WMSCR shall permit the display and editing of any and all documents (messages, reports, listings, etc...), including all documents larger than the physical screen size.

3.1.4.4.2.1.1.1 On-line control. The WMSCR shall permit all control functions to be performed on-line. Control functions shall include system configuration via adaptation data bases, system monitoring, and system control. The WMSCR shall not require off-line control utilities for on-line system configuration.

3.1.4.4.2.1.1.2 Command language syntax. The on-line command language shall have a consistency of syntax for all commands and shall be oriented toward ease of operation. The language shall have extensive HELP (structured referencing to user control syntax) and tutorial capabilities (structured reference to user control semantics). All WMSCR commands shall be self-verifying to ensure that no command entry can cause the operational WMSCR to fail.

3.1.4.4.2.1.1.3 Operator terminal security. The WMSCR shall restrict the command capabilities of each control terminal by a security feature. There shall be three levels of operator privilege:

(a) Operator (edit and data entry functions only).
(b) Supervisor (system control functions).
(c) System manager (system reconfiguration functions).

All priveleges available at the Operator level shall also be available at the Supervisor level. All privileges available at the Supervisor level shall also be available at the System Manager level. The commands available to each level shall be defined by the system manager. The system manager shall have access to all system commands but shall be required to execute a log-on procedure. The other two levels shall not require a log-on procedure. Only one terminal at a time shall be assigned supervisory privileges.

3.1.4.4.2.1.1.4 Command recording. The WMSCR shall record the entry of all operator commands on the system event log.

3.1.4.4.2.1.2 Printer operation. The WMSCR shall associate one of the hardcopy printers with each command terminal. More than one control terminal shall be permitted to share the same printer. The WMSCR shall provide an operator command to print the control terminal data on an associated printer. In addition, the WMSCR shall provide an operator command capability to direct any output that would normally be returned to the terminal screen to be sent instead to an associated printer.

3.1.4.4.2.1.3 System event log printer. The WMSCR shall provide the capability for printing of unsolicited (computer-to-operator) messages on a dedicated system event log printer (refer to 3.3.1.8.2). This capability is described in 3.1.4.4.1.4.

3.1.4.4.2.1.4 Operator alarm. The WMSCR shall sound an audible alarm when a critical event occurs. This critical event shall be fully described by the descriptive text on the system event log. The alarm shall not be specific to a particular control terminal but shall at a minimum of 86 dB from all terminals within 50 feet of the CPU. The audible alarm shall require a supervisor entered command to quiet the alarm.

3.1.4.4.2.2 Operator control functions. The WMSCR shall provide the following operator control functions as a minimum:

(a) Communications Function:

1) Communications interface control
2) Communications storage control

(b) Processing Function:

3) Processing control
4) Assembly control
5) Editing control

(c) Weather and NOTAM Storage and Retrieval Function:

6) Journal control
7) Weather and NOTAM data base(s) control

(d) Control Function:

8) Overall system control
9) System event log control

3.1.4.4.2.2.1 Communications function.

3.1.4.4.2.2.1.1 Communications interface control. The WMSCR shall provide commands that provide operator control of all communications interfaces of the system.

3.1.4.4.2.2.1.1.1 Network configuration control. The WMSCR shall provide the capability for operator command to define and modify the communications configuration of WMSCR. This capability shall include definition of new circuits (both physical circuits and NADIN virtual circuits), deletion of existing circuits, and modification of the characteristics of existing circuits. All changes in communication configuration shall be reflected in changes to the Network Configuration Data Base (NCDB). Changes to the physical characteristics of the network shall be available by off-line command. All other configuration changes shall be made by on-line commands. On-line reconfiguration shall not interfere in the operation of circuits not affected. This function shall prohibit the entry of incorrect or inconsistent information.

3.1.4.4.2.2.1.1.2 Circuit activation and deactivation. The WMSCR shall provide an operator command to control the operational status of each interface. An interface may be set to active or inactive status. This function shall permit overriding of the automatic setting of the circuit status. The transition from an operational status to a non-operational status shall permit the completion of link, network, and transport layer procedures on the circuit.

3.1.4.4.2.2.1.1.3 Network status display. The WMSCR shall provide the capability to display the status of individual circuits, groups of circuits, or the entire network by operator command. The status display for each circuit shall include the number of messages per logical channel for the last hour, the current operational status, a listing of all error conditions that have occurred within the past hour, the associated source routing, and the number of logical channel connections.

3.1.4.4.2.2.1.1.4 Circuit event notification and alarm. The WMSCR shall send an event notification to the system event log whenever a logical connection cannot be made or a physical channel fails. If the event represents a failure that requires operator intervention the operator alarm shall also be activated.

3.1.4.4.2.2.1.1.5 Circuit testing. The WMSCR shall provide the capability to perform on-line test procedures on any physical circuit. The results of the test shall be presented on the network status display and presented in a report that shall be sent to the system event log and stored on the MPS storage file.

3.1.4.4.2.2.1.2 Communication storage control. The WMSCR shall provide features that will permit control of the communications data storage function (see 3.1.4.1.2).

3.1.4.4.2.2.1.2.1 Display communication storage status. The WMSCR shall provide the capability for operator command to display information about each communications data storage partition. The displayed information shall include the number of messages stored at each priority level, the time of the oldest message, and the alternate destination status. The WMSCR shall also have the capability of displaying the circuit associated with each partition.

3.1.4.4.2.2.1.2.2 Communications storage retrieval. The WMSCR shall provide the capability for operator command to display a list of any or all products that are stored in communications storage. The WMSCR shall also provide the capability to display the text of the product if it is an alphanumeric.

3.1.4.4.2.2.1.2.3 Operator-controlled data deletion. The WMSCR shall provide the capability for an operator command to delete messages in communications data storage. This capability shall be provided to delete messages within a partition based on priority, age, type and combinations thereof.

3.1.4.4.2.2.1.2.4 Alternate destination activation/deactivation. The WMSCR shall provide the capability for the operator command to start and terminate an alternate destination relationship between two partitions.

3.1.4.4.2.2.2 Processing function.

3.1.4.4.2.2.2.1 Processing control. The WMSCR shall provide commands that provide operator control of all processing functions of the system.

3.1.4.4.2.2.2.1.1 Add element to the PIDB. The PIDB shall be modifiable on-line by operator commands. There shall be no disruption of the processing function during operator controlled modification. In response to each of the following commands, the WMSCR shall display the status of the last PIDB updated. The WMSCR shall provide the capability for on-line addition of elements to the PIDB. The add PIDB function may be entered at any time and shall also be available to the operator performing product data editing on an unknown product. The add function shall require that the operator specify, at a minimum, the UPI for the entry. Operator entry of all other PIDB information or additional functions, as described in the following, shall be permitted as part of the add function.

3.1.4.4.2.2.2.1.2 Delete element from the PIDB. The WMSCR shall provide the capability for on-line deletion of elements from the PIDB. The WMSCR shall delete single PIDB elements when a full UPI is specified.

3.1.4.4.2.2.2.1.3 Modify product distribution. The WMSCR shall provide the capability for on-line modification of the routing distribution pattern established for each data product. The WMSCR shall also provide the capability to make identical routing modifications to groups of products with the same type of product identificaiton. The WMSCR shall provide the capability for the operator to specify that additional destinations are to be added, to specify that existing destinations are to be deleted, or that the existing set of destinations are to be replaced entirely by a new set.

3.1.4.4.2.2.2.1.4 Modify product validation criteria. The WMSCR shall provide the capability for on-line modification of the validation criteria for any particular data product. The WMSCR shall also provide the capability to modify the validation criteria for groups of data products with the same type of product identification.

3.1.4.4.2.2.2.1.5 Modify product priority. The WMSCR shall provide the capability for changing the priority associated with each product in the PIDB. The WMSCR shall also provide the capability for changing the priority of groups of data products with shared product identifications.

3.1.4.4.2.2.2.1.6 Modify weather product retention information. The WMSCR shall provide the capability for on-line modification of the retention period of each weather data product. The WMSCR shall also provide the capability to modify the retention period for a group of weather products with shared product identifications.

3.1.4.4.2.2.2.1.7 Modify product triggered assembly information. The WMSCR shall provide the capability for the on-line modifying of the product assembly triggering information contained in the PIDB. The WMSCR shall allow the addition of new format definitions names to the PIDB. The WMSCR shall also permit the deletion of existing definition names from the PIDB. The WMSCR shall permit the replacement of the existing set of names with an entirely new set. The WMSCR shall be capable of performing the functions stated above on a single PIDB entry or on a group of PIDB entries with shared product identifications.

3.1.4.4.2.2.2.1.8 Modify product processing information. The WMSCR shall provide the capability to modify the product processing information contained in each PIDB entry. The WMSCR shall permit the modification of a single PIDB entry or to a group of PIDB entries with shared product identifications.

3.1.4.4.2.2.2.1.9 Display product status. The WMSCR shall provide operator command capability to display the status of a specific product, including all of the information in the PIDB and the history of that product arrivals. Refer to 3.1.4.4.2.2.3.2.2.1 for details of this function.

3.1.4.4.2.2.2.1.10 Modify routing by source. The WMSCR shall provide the capability to change the routing associated with each data source (input circuits and product assembly). For each source, the WMSCR shall provide the capability to add new destinations, delete existing destinations, and replace existing destinations with new destinations.

3.1.4.4.2.2.2.2 Product assembly control. The WMSCR shall provide the capability for operator commands to modify the contents of the PADB and to perform overall control of the product assembly function.

3.1.4.4.2.2.2.2.1 DELETED.

3.1.4.4.2.2.2.2.2 Status display of product assembly. The WMSCR shall provide the capability to request the display of the status of the product assembly function. The resultant display shall indicate the current status of product assembly (idle, active), the next element in the schedule to be processed, the source routing associated with product assembly, and a summary of activity for the prior 60 minutes.

3.1.4.4.2.2.2.2.3 On-line update of PADB. The WMSCR shall provide the capability for full on-line operator command and control of the PADB. Both parts of the PADB, the schedule and the format definitions, shall be modifiable by the following command functions.

3.1.4.4.2.2.2.2.3.1 Display PADB schedule. The WMSCR shall provide the capability for operator control to display the daily internal product assembly schedule. This display function shall be selectable and limited to elements in a specific time window from 5 to 1440 minutes. All information about the schedule shall be displayed.

3.1.4.4.2.2.2.2.3.2 Addition and deletion of PADB schedule entries. The WMSCR shall provide the capability for on-line operator control to add new entries to the daily schedule, delete entries, and change the execution times of existing entries.

3.1.4.4.2.2.2.2.3.3 Creation of temporary entries in the PADB schedule. The WMSCR shall provide the capability for on-line operator control to create temporary entries in the PADB schedule. These entries shall be executed once and then deleted.

3.1.4.4.2.2.2.2.3.4 Suppression of PADB schedule entries. The WMSCR shall provide the capability for on-line operator command to suppress existing entries for one cycle with automatic reinstatement of entry function. Another version of this same feature shall permanently suppress an entry (without deleting it) until manually restored. The WMSCR shall provide the capability to restore suppressed entries by individual schedule entry or by a time range.

3.1.4.4.2.2.2.2.3.5 Modify format definitions. The WMSCR shall provide the capability to create new format definitions using the text editing capabilities of the operator control terminal. It shall be possible to modify or delete existing format definitions. At all times the WMSCR shall ensure a consistency between the schedules and the formats.

3.1.4.4.2.2.2.2.4 Off-line backup and restore. The WMSCR shall provide a capability to back up all static data bases to off-line storage and shall provide the capability to restore all static data bases in cases of a failure of the on-line data base.

3.1.4.4.2.2.2.3 Editing control. The WMSCR shall support a series of command functions to control the error-correction process described in 3.1.4.2.3. These are described in the following subsections.

3.1.4.4.2.2.2.3.1 Initiate manual editing. The WMSCR shall provide a command function that puts a command terminal in the manual editing mode. The first and highest priority product waiting for correction shall be displayed as a result of this command. While in the manual editing mode, the terminal shall continuously display the number of messages waiting for manual editing.

3.1.4.4.2.2.2.3.2 Scan for further errors. The WMSCR shall support a command a that shall cause data to be scanned for errors. The result of this scanning process shall be displayed on the screen as a textual description of the error and a cursor or highlight that locates the error.

3.1.4.4.2.2.2.3.3 Return product for processing. The WMSCR shall support a command that will cause the displayed product to be returned to the processing function for normal distribution.

3.1.4.4.2.2.2.3.4 Terminate manual editing. The WMSCR shall support a command that shall cause a return to normal mode at the terminal during editing. Any product being manually edited shall be automatically requeued for subsequent data editing.

3.1.4.4.2.2.2.3.5 Create a PIDB entry. The WMSCR shall support an operator command to create a PIDB entry while in the manual editing mode. The features of this command shall be identical to those defined in 3.1.4.4.2.2.2.1.1 but shall be executable without leaving the manual editing mode.

3.1.4.4.2.2.2.3.6 Data entry. The WMSCR shall provide a command function that puts a command terminal into data entry mode. While in the data entry mode, the terminal shall provided the capability for the edit operator to enter data for subsequent processing.

3.1.4.4.2.2.3 Static and dynamic data base control. The WMSCR shall provide the capability for operator control of the static and dynamic data bases.

3.1.4.4.2.2.3.1 Static data base control.

3.1.4.4.2.2.3.1.1 Static data base control for product information. The static data base for product information is the PIDB. Refer to 3.1.4.4.2.2.2.1 for a complete description of PIDB control functions.

3.1.4.4.2.2.3.1.2 Station Information Data Base control. The WMSCR shall provide control functions that will permit the addition and deletion of information in the SIDB.

3.1.4.4.2.2.3.1.2.1 Addition of a reporting station. The WMSCR shall provide the capability for the operator to add a new reporting station to the SIDB. The SIDB shall permit a minimum of 20,000 station entries. This entry shall require the full station identification and may also include additional information as defined in 3.1.4.4.2.2.3.1.2.3.

3.1.4.4.2.2.3.1.2.2 Deletion of reporting stations. The WMSCR shall provide the capability for operator deletion of existing stations from the SIDB. The WMSCR shall delete a single-station entry if a full reporting station identification is entered.

3.1.4.4.2.2.3.1.2.3 Modification of reporting station information. The WMSCR shall permit operator modification of the information in the SIDB, including:

(a) Station geographical location.

(b) Station title.

3.1.4.4.2.2.3.1.2.4 Station Information Data Base status. The WMSCR shall provide the capability for operator display of the contents of any SIDB entry including a display of information about all reports from that station stored in the dynamic report data base(s).

3.1.4.4.2.2.3.2 Dynamic data base control. The WMSCR shall provide command features that will permit operator control of the dynamic portion of the weather and NOTAM data base(s).

3.1.4.4.2.2.3.2.1 Overall dynamic data base status. The WMSCR shall provide the capability for the operator to request information about the overall status of the dynamic data base. This information shall consist of the following as a minimum:

(a) Total storage allocated to the dynamic weather an NOTAM data base(s).

(b) Amount of total storage currently in use.

(c) Number of weather products stored.

(d) Number of weather reports stored.

(e) Number of NOTAM reports stored.

3.1.4.4.2.2.3.2.2 Dynamic data base data manipulation. The WMSCR shall provide the capability for operator examination and correction of the data in the dynamic weather and NOTAM data base(s). This capability shall include features for determining the status of specific products and groups of data products and specific reports and groups of reports. The ability to modify the contents of the data base(s) shall be restricted to the supervisor.

3.1.4.4.2.2.3.2.2.1 Display weather product status. The WMSCR shall provide the capability for the display of the status of any weather product or groups of weather products in the weather product data base. The display shall include, as a minimum, the following information:

(a) Product identifications(s).

(b) Product receipt time(s).

(c) Product size(s).

(d) Purge time(s).

The WMSCR shall have the capability to display product status about a specific weather product or about all weather products matching a partially specified UPI. If multiple versions of any weather product are present on the data base, information about each version shall be displayed.

3.1.4.4.2.2.3.2.2.2 Display weather and NOTAM report status. The WMSCR shall provide the capability for the display of information about reports or groups of reports stored on the dynamic weather and NOTAM data base(s). This display shall include, as a minimum, the following information:

(a) Report identification including report type, reporting station, applicable time, and version information.

(b) Receipt time(s).

(c) Report size.

The WMSCR shall provide the capability for operator command to qualify the report status request by either specifying a specific reporting station or group of stations, weather report type or a group of data types, and a time range.

3.1.4.4.2.2.3.2.2.3 Display weather product text. The WMSCR shall provide the capability for operator command to display on the control terminal the text of any weather product stored on the dynamic weather product data base. Requests for the display of non-textual products will be treated as product status requests. The WMSCR shall accept requests with fully defined UPI.

3.1.4.4.2.2.3.2.2.4 Display weather and NOTAM report text. The WMSCR shall provide the capability for operator command to display on the control terminal the text of any report stored on the data base. The WMSCR shall accept requests for the display of reports from a single station or from a group of stations. Qualification of report request, by type and time range, shall be permitted.

3.1.4.4.2.2.3.2.2.5 Modify products and reports. The WMSCR shall provide the capability for operator command to modify and reenter products and reports that have been retrieved by the defined commands. The full text editing features of the command terminal shall be available for the modification of the text. An operator command function shall control the restorage of the data into the data base.

3.1.4.4.2.2.3.2.2.6 Deletion of products and reports. The WMSCR shall provide the capability for deletion of products and reports from the dynamic data base(s) under operator control. The WMSCR shall accept deletion requests for fully defined product or report identifications. This action shall be recorded in the system event log.

3.1.4.4.2.2.3.2.2.7 Modify default weather report retention period. The WMSCR shall provide the capability for an operator command to define and modify the default report retention period required for weather report deletion (see 3.1.4.3.4.2).

3.1.4.4.2.2.3.3 Collective breakdown data base modification. The WMSCR shall provide the capability for the operator to modify, on-line, the collective breakdown adaptation data base described in 3.1.4.3.2.2.2.1.

3.1.4.4.2.2.3.4 Textual retrieval adaptation data base maintenance. The WMSCR shall provide the capability for the operator to maintain on-line the adaptation data base that controls the features of the textual retrieval language (see 3.1.4.3.3.1.2.1). The following functions shall be supported:

(a) Display, addition, deletion, and modifications of retrieval lists used in the "RL" queue.

(b) Display, addition, deletion, and modifications of predefined lists of stations (see 3.1.4.3.3.3.10).

(c) Display, update of information limiting specific subscribers to specific retrieval services.

(d) Display and modification of all on-line and off-line retrieval parameters.

3.1.4.4.2.2.3.5 Journal control. The WMSCR shall support several commands to control the system journal function described in 3.1.4.3.5. These are described in the following subsections.

3.1.4.4.2.2.3.5.1 Journal status display. The WMSCR shall display the current status of the journaling function in response to the entry of an operator command. The journal status shall include, as a minimum, the following information:

(a) Time since the last off-line journal transfer.

(b) The total number of bytes of data waiting transfer to off-line media.

(c) The total on-line journal capacity.

3.1.4.4.2.2.3.5.2 Journal off-line transfer command. The WMSCR shall support an operator command to initiate the transfer of data from the on-line journal to off-line media.

3.1.4.4.2.2.3.5.3 Execute journal utility. The WMSCR shall provide the capability for the operator to control the execution of the journal utility functions described in 3.1.4.3.5.3. The operator shall propose an execution list defining the utilities to be executed and the parameters required for each utility. This list shall be submitted for execution without interference with on-line WMSCR activity.

3.1.4.4.2.2.4 Control function.

3.1.4.4.2.2.4.1 Overall system control.

3.1.4.4.2.2.4.1.1 System startup/restart. The WMSCR shall execute the system startup/restart procedure in response to an operator command. The startup/restart function shall initiate the WMSCR system in a manner consistent with the status and configuration of both WMSCR nodes and the status of all attached communication circuits and equipment.

There are two modes of the system startup/restart function:

(a) Restart while in normal operating mode.

(b) Restart while in degraded operating mode.

Refer to 3.1.4.4.1.3 for a description of operating modes and states as they relate to system failure.

3.1.4.4.2.2.4.1.1.1 Restart while in normal operating mode. Upon failure of a node a restart of that node shall be attempted prior to transfer of control to the surviving node. It shall occur as part of the recovery from hardware or software failures. It can occur manually or automatically. It is assumed that the data bases are intact. While restarting in this mode, WMSCR shall initialize all interfaces to their status at the time of failure. All other WMSCR functions shall be initialized to their status at the time of failure. Upon successful completion of a restart an equivalence test shall be performed between nodal data bases to determine the integrity of each node.

3.1.4.4.2.2.4.1.1.2 Restart while in degraded operating mode. A restart while in degraded mode means that a node has failed and is to be restarted after its functions have been transferred to the other node. It is assumed that the data bases are not current. The failed WMSCR node shall automatically enter the recovery state, and the operating node shall enter the recovery support state during which the two nodes shall cooperate to reestablish the data bases at the failed node. At the completion of this function, the failed node shall revert to the primary state, and responsibility for the transferred interfaces shall automatically revert to the previously failed node.

3.1.4.4.2.2.4.1.2 Hardware configuration control. The WMSCR shall provide for the definition of the system configuration. The WMSCR shall also provide on-line capability for the operator to specify which elements are to be in operational use and which elements are to be in a standby or off-line status.

3.1.4.4.2.2.4.1.3 Operational configuration control. The WMSCR shall provide the capability for an operator command to set or change the operational configuration status of the WMSCR. The operational configuration status shall correspond to the availability (or unavailability) of system elements (circuits, nodes, interfacing systems, etc.). Normally, the configuration status is determined automatically, but this command feature shall permit manual override of automatic operation. The WMSCR shall ensure that the operator at one node shall not be able to access any system parameter that is being changed at the other node.

3.1.4.4.2.2.4.1.4 Display overall system status. The WMSCR shall provide an overall system status display that can be requested by an operator command. The WMSCR shall also permit the operator at one node to request the display of the status of the other node. This display shall be selectable to show all or any part of the status of the following:

(a) Hardware configuration status.

(b) System operational configuration, including the status of each node, interfacing systems, communications interfaces,and software elements.

(c) Overall system statistics, as defined in 3.1.4.4.1.5.

(d) A list of unacknowledged critical event notifications.

(e) Status of all the WMSCR data bases.

3.1.4.4.2.2.4.1.5 Major processing functions status display. The WMSCR shall provide the capability to display the status of the WMSCR processes by operator command. This display shall report on each of the major processes which includes the Communications, Processing, Storage and Retrieval, and Control functions. All status information, as defined in 3.1.4.4.1.5, about the functioning of a process shall be displayed.

3.1.4.4.2.2.4.1.6 Privilege data base maintenance. The WMSCR shall provide command features to display, add, delete, or modify entries in the operator privilege data base. This capability shall be restricted to the system manager by security procedures (see 3.1.4.4.2.1.1.3).

3.1.4.4.2.2.4.1.7 Printer function configuration. The WMSCR shall provide a command function that will associate specific hard-copy printers to specific command terminals. The WMSCR shall also support a command that shall designate which of the hard-copy printers will be the system event log hard-copy device. The event-log printer shall not be associated with any command terminal.

3.1.4.4.2.2.4.1.8 Data base maintenance control. The WMSCR shall provide for the control of all nodal data base(s) by operator command to determine the operational status of each data base and to initiate repair or copy activities as required. The WMSCR shall provide for the transfer of any part of a dynamic, static, and adaptation data base to off-line storage under operator control. The WMSCR shall also permit the restoration of any part of a data base from off-line storage media under operator command.

3.1.4.4.2.2.4.1.9 Internodal utility control. The WMSCR shall provide for the initiation of the internodal utility by operator command.

3.1.4.4.2.2.4.2 System event log control. The WMSCR shall support several command functions used in association with the system event log feature described in 3.1.4.4.1.4. These are described in the following subsections.

3.1.4.4.2.2.4.2.1 Display portion of event log on control terminal. The WMSCR shall support the display of a any portion of the system event log on any command terminal when requested by a system operator. The WMSCR shall provide the capability for operator control to specify a time range and priority level(s) to be displayed. The WMSCR shall provide the capability to display all unacknowledged critical events.

3.1.4.4.2.2.4.2.2 Audible alarm response. The WMSCR shall provide the capability for operator command to respond to an audible alarm associated with an event reported on the system event log. The WMSCR shall permit the silencing of the audible alarm by the entry of a function key. However, each critical event shall also require individual operator acknowledgment by the entry of an acknowledge command. Unacknowledged critical events shall continue to appear on the overall system status display described in 3.1.4.4.2.2.4.1.4.

3.1.4.4.3 Performance requirements.

3.1.4.4.3.1 Internodal coordination requirements. Internodal coordination performance is defined as the time between the occurrence of an event at one node and the completion of the corresponding activity at the other node. The following performance requirements for each of the defined coordination activities shall be met:

(a) Input Data Coordination: 30 seconds after the identification of incoming product data.

(b) Output Data Coordination: 30 seconds after the completion of transmission of a product.

(c) NCDB/PIDB/PADB/SIDB coordination: Within 10 seconds after the completion of a change to one of these adaptation data bases at one node.

(d) Internodal Data base replenishment: This utility shall achieve an effective transfer rate of 75-percent of the internodal link bandwidth.

(e) Internodal Data base comparison: This utility shall perform a complete internodal data base comparison in a time equal to or less than that shown by the following formula:

$$t = \frac{y * N}{B} + 20 \text{ seconds}$$

where

t = Time of execution (in seconds).

N = Sum of the number of products in the two data bases.

B = 75 percent of the available link bandwidth in bytes per second.

y = Number of bytes required to establish product correlation for each product.

(f) Internodal adaptation data base replenishment: The WMSCR shall permit the exchange of entire adaptation data bases at an efficiency of not less than 75-percent of the available internodal link bandwidth.

3.1.4.4.3.2 Failure recovery.

3.1.4.4.3.2.1 Component failure. The WMSCR shall detect and recover from the failure of a critical element by the substitution of a redundant element (if available) within 10 seconds.

3.1.4.4.3.2.2 Nodal transfer. The WMSCR shall automatically transfer responsibility for supporting external users to the remote WMSCR upon the unrecoverable failure of a node, as defined in 3.1.4.4.1.3.2.2(a) and (b). Nodal transfer shall also occur manually, as defined in 3.1.4.4.1.3.2.2(c). This reconfiguration shall occur in less than one minute. The reestablishment of output traffic in communications data storage to the users who have been transferred shall be completed within an additional 2 minutes.

3.1.4.4.3.3 Operator command functions. Unless otherwise stated in Table 1, completion of the WMSCR operator commands shall take less than the following times:

(a) For commands that display status only: less than one second, 50 percent of the time, and less than three seconds, 95 percent of the time.

(b) For commands that update elements in the data base: less than three seconds, 50 percent of the time, and less than five seconds, 95 percent of the time.

3.1.4.5 Development and testing function. The WMSCR shall have features that shall support system development and testing. These features shall support continuing system enhancement and revisions throughout the lifetime of the system. Conceptually, these features shall consist of:

(a) a software development test bed

(b) a communications network simulator.

3.1.4.5.1 Software development test bed. The WMSCR software test bed shall permit the development of all WMSCR application software and the testing of individual elements and of the entire system. Each WMSCR node shall be equipped with the software development tools defined in Section 3.3.2.8 plus any other features required to provide the testing and simulation capabilities described below. Testing shall be independent of the operational environment thereby permitting the simultaneous and independent execution of an operational WMSCR and a developmental WMSCR. No failure within the test bed shall affect the operational WMSCR. System resources at a node shall be sufficient for the simultaneous execution of an operational and test version of the WMSCR. The test version may involve up to five physical interfaces. A node not supporting an operational WMSCR shall be able to execute a full nodal test. The two software development Video Display Terminal (VDT) (refer to section 3.3.1.7) shall be available to support development and testing functions. In addition, at least one operator control terminal(s) shall be able to be temporarily allocated to the testing environment.

3.1.4.5.1.1 Unit testing. Each WMSCR node shall provide the built-in ability to conduct tests of specific system elements. A system element is a specific interface or a specific processing function.

Function	Execution Times 50%	95%
Communications Control:		
Network status display	1.0	3.0
Circuit activation/deactivation	3.0	5.0
Circuit reconfiguration	5.0	10.0
PIDB-oriented commands:		
PIDB status display	1.0	3.0
Add PIDB entry	3.0	5.0
Delete PIDB entry	3.0	5.0
Modify product distribution	3.0	5.0
Modification of validation criteria	3.0	5.0
Modify product priority	3.0	5.0
Modify product retention	3.0	5.0
Modify product trigger information	3.0	5.0
Modify product processing information	3.0	5.0

The above PIDB commands also shall operate globally on the entire PIDB. For global operations, each command shall be permitted an additional 2.5 seconds for each 1,000 entries in the PIDB.

Modify Routing by Source	3.0	5.0
SIDB-oriented commands:		
Display status SIDB entry	1.0	3.0
Add a new reporting station	3.0	5.0
Delete a reporting station	3.0	5.0
Modification of reporting station information	3.0	5.0

The above SIDB commands also shall operate globally on the entire SIDB. For global operations, each command shall be permitted an additional 2.5 seconds for each 1,000 entries in the SIDB.

Dynamic data base commands:		
Display product status	1.0	3.0
Display report status	1.0	3.0
Display product text	1.0	3.0
Display report text	1.0	3.0
Deletion of product or report	3.0	5.0

The above commands also shall operate globally on the entire dynamic data base. For global operations, each command shall be permitted an additional 2.5 seconds for each 1,000 entries in the PIDB or SIDB.

Table 1. WMSCR Operator Command Execution Time

Function	Execution Times 50%	95%
Modify collective breakdown adaptation data base	5.0	10.0
Modify data retrieval adaptation data base	5.0	10.0
Communications data storage control commands:		
Status display	1.0	3.0
Data retrieval	3.0	5.0
Deletion (per ten elements deleted)	2.5	5.0
Activate/deactivate alternate destination	3.0	5.0
PADB-oriented commands:		
Display status of product assembly	1.0	3.0
Display PADB schedule	1.0	3.0
Add/delete PADB schedule	3.0	5.0
Create temporary PADB schedule entries	3.0	5.0
Suppress PADB schedule entries	3.0	5.0
Modify Format Definition	(no performance specified)	
Editing commands:		
Initiate editing	3.0	5.0
Scan for further errors	1.0	3.0
Return product for distribution	3.0	5.0
Terminate editing	1.0	3.0
Create PIDB entry	3.0	5.0
System event log/journal commands:		
Display portion of system event log on command terminal	3.0	5.0
Activate/deactivate system event log printer	1.0	3.0
Audible alarm response command	1.0	3.0
Journal status display	1.0	3.0
Start/terminate journal off-line transfer	3.0	5.0
Execute journal functions	(no performance specified)	

Table 1. WMSCR Operator Command Execution Time (Cont...)

3.1.4.5.1.2 Nodal testing. Each WMSCR node shall provide the built-in ability to conduct tests of the entire node involving all interfaces and all processing functions.

3.1.4.5.2 Network simulator. The WMSCR shall have a communications network simulator which shall permit testing the WMSCR without the need for actual communication interfaces. The simulator shall have the capabilities to reallocate system resources so that sufficient resources shall be available to simulate the WMSCR network and subscribers. The WMSCR test bed and the simulator shall operate with logical independence although they may share hardware or software resources. The connection between the test bed and the simulator shall be physical communications interfaces.

3.1.4.5.2.1 Interface simulation. The network simulator shall have the capability to duplicate the logical characteristics of all WMSCR physical interfaces. The simulator shall duplicate the characteristics of the physical interfaces between the WMSCR and: NADIN PSN, NWSTG, NWID, CTS, collated AWP, and WMSCR remote node. The simulator shall duplicate the logical interface characteristics of all NADIN PSN subscribers which include CNSP, MPS, SAS, Air Transport Association (ATA) subscribers, APAD, NADIN message switch gateway, NSSFC, Carswell Air Force Base, MWP, WCP, TMP and other WMSCR System Specification users. The network simulator shall have the capability to simulate as little as a single physical/logical interface and as much as the entire proposed WMSCR network.

3.1.4.5.2.2 Test data set entry and storage. The network simulator shall provide features for the entry and storage of predefined test data sets for input to the WMSCR from each simulated interface (per Appendix 1). A test data set shall consist of the data itself and a schedule for its introduction on the interface. The WMSCR shall provide the capability for the operator to compose and/or correct test data sets using the operator terminals. The WMSCR shall provide support programs permitting the conversion of data on external media to test data sets.

3.1.4.5.2.3 Traffic capture and display. The simulator shall provide features for the capture, storage and subsequent display of traffic transmitted on any input or output interface during a test.

3.1.4.5.2.4 Network simulator configuration. The network simulator shall provide features for operator configuration for specific tests in accordance with test data set magnitudes defined in Appendix I. The configuration process shall define which interfaces are to be supported, which test data are to be used, and which traffic and statistics are to be captured and maintained.

3.1.5 WMSCR functional flow diagram. Refer to Figure 2.

3.1.6 Configuration allocation. To be specified by system design activity.

3.1.7 Interface requirements.

3.1.7.1 External interfaces. The WMSCR receives data from or sends data to a variety of external sources. The WMSCR interface with each of the external systems shall be in compliance with the requirements set forth in the respective IRD to be found as appendixes to this specification. A list of all external systems interfacing with the WMSCR is given below with reference to the respective Interface Requirement Documents.

(a)	NWSTG	NAS-IR-90022507
(b)	AWP	NAS-IR-25042507
(c)	RWP	NAS-IR-25072511
(d)	Packet Network User	NAS-IR-94022507
(e)	Asynchronous PAD User	NAS-IR-94032507
(f)	MPS	NAS-IR-51030002
(g)	CNSP	NAS-IR-25072505
(h)	ADAS	NAS-IR-25082507
(i)	Message Switch Network User	NAS-IR-94012507
(j)	WCP	NAS-IR-25072503
(k)	TMP	NAS-IR-25072401
(l)	CTS	NAS-IR-92020000

3.1.7.1.1 External systems interface diagram. Refer to Figure 1.

3.1.7.2 Internal interfaces. To be specified by system design activity.

3.1.8 Government-furnished property list. Government-furnished facilities, equipment, and services will be identified in the contract schedule.

3.2 System characteristics. This subsection specifies WMSCR physical characteristics including physical requirements, environmental conditions, materials, electromagnetic radiation requirements, workmanship, interchangeability, safety, deployment requirements, human performance/human engineering, and nameplates and nomenclature.

3.2.1 Physical requirements.

3.2.1.1 Weight Limits. The cabinets and frames shall be designed for an average weight distribution of floor loading not to exceed 125 lb/ft2 (610.3 kg/m2).

3.2.1.2 Dimensional limits. The WMSCR node equipment, including the operational positions and equipment units (racks, cabinets, consoles, and frames), shall be placed within a 1,450-sq.ft. room in the National Aviation Weather Processing Facility (NAWPF). The WMSCR equipment dimensions shall not exceed the size limits for transportability within the NAWPF.

3.2.1.2.1 Accessibility. Equipment units shall provide front access, or rear access, or both, as needed for maintenance and repair activities.

3.2.1.2.2 Access clearance. Distance required for maintenance access between the rows of equipment units shall not exceed 5 feet (1.5 m) for front access and 4 feet (1.2 m) for rear access.

3.2.1.3 Durability. The structural strength and rigidity of the equipment units shall be such that common carrier handling in loading, shipping, unloading, and setting into position for installation will not cause damage to any WMSCR component nor deformation to the equipment units.

3.2.1.4 Power requirements. The WMSCR shall operate on one or both of the FAA-supplied electrical power services available within the NAWPF. The power consists of 120 volts ±10 percent, 60 Hz ± 2 percent, single-phase three-wire service, and 208 volts, ±10 percent, 60 Hz ± 2 percent, three-phase four-wire service from a Power Conditioning System (PCS). WMSCR power protection devices shall be provided to ensure that the WMSCR operates without damage from power and frequency fluctuations of the PCS.

3.2.1.4.1 Power distribution. Power will be furnished to the WMSCR through individual circuit breakers. Overload protection and further distribution shall be designed within the WMSCR. WMSCR power distribution requirements are:

(a) The WMSCR shall be designed to minimize the phase-to-phase load imbalance for three-phase power and meet the Federal load balance specified in FAA-STD-020.

(b) Each equipment unit shall be provided with a single circuit breaker for supply-power overload protection, as well as a visible circuit-breaker indicator.

(c) Each equipment unit shall provide for the distribution of electrical power within the unit.

(d) Each chassis mounted in the equipment units shall be provided with a single circuit breaker for supply power overload protection.

(e) All circuit breakers shall be provided with a mechanical shield to prevent accidental tripping.

(f) Design of the WMSCR shall be such that the removal of power from any component cannot damage any other component.

3.2.1.5 Electrical grounding/interfacing.

3.2.1.5.1 Grounding and bonding. The WMSCR system grounding and bonding shall be in accordance with FAA-STD-020. WMSCR grounding and bonding shall be compatible with that of other equipment interfacing with the WMSCR. Refer to FAA-STD-020, Section 3.8.4, for equipment containing both low and high frequency circuits. Refer to the following guidance for grounding of low speed circuits only.

3.2.1.5.2 Grounding networks. The WMSCR shall have at least four grounding networks:

(a) AC ground.

(b) Chassis ground.

(c) Signal ground.

(d) Circuit ground.

3.2.1.5.2.1 AC ground. A common AC ground derived from the AC power source in the NAWPF shall be used for all AC power in the system. The WMSCR AC neutral shall be kept separate from the equipment frame and signal grounds. The FAA will furnish the single point earth ground and the AC power ground at both sites.

3.2.1.5.2.2 Chassis ground. All surfaces of panels, chassis, frames, and cabinets shall be at a common chassis ground potential. The ground for equipment located at operating positions shall be connected to the common chassis ground potential. The WMSCR chassis ground shall be isolated from signal ground. AC safety ground and chassis ground shall be identical. The chassis ground shall be connected to the NAWPF ground system. All frame surfaces that are fastened together shall be treated to provide non-oxidizing contact surfaces so that an acceptable chassis ground is achieved. WMSCR equipment units shall have a ground bus.

3.2.1.5.2.3 Signal ground. The WMSCR signal ground shall be isolated from the WMSCR chassis ground. The chassis ground system shall not be used to provide signal return paths.

3.2.1.5.2.4 Circuit ground. Communications trunk circuit equipment shall have a separate ground system. When the WMSCR interfaces with common carrier facilities, the circuit ground shall be connected to the common carrier grounding system.

3.2.1.5.2.5 Return paths. Each signal and control cable shall be provided with a minimum of one return path. Separate wires shall be used for power supply returns. Outer conductors or shields shall not be used as signal or power returns.

3.2.1.5.2.6 Electrostatic discharge (ESD). WMSCR equipment accessible by users shall be immune to ESD from personnel bearing a static charge.

3.2.1.6 Wiring. All WMSCR equipment and wiring shall be in accordance with the applicable portions of the National Electrical Code (NEC) NFPA-70, published by the National Fire Protection Association (NFPA).

3.2.1.7 Cooling.

3.2.1.7.1 Internal temperature. The internal temperature of an operating WMSCR shall stay within the operating limits of all WMSCR components without requiring special cooling equipment other than forced-air cooling using room temperature air.

3.2.1.7.2 Forced-air cooling. Either explosion-proof motors or motors accompanying for the WMSCR equipment, shall be used if forced-air cooling is used.

3.2.1.7.3 Airflow. Mounted WMSCR equipment shall be arranged so that natural-and-forced-convection airflow is optimized.

3.2.1.8 Security. There shall be no physical security devices required on WMSCR equipment.

3.2.2 Environmental conditions. The WMSCR shall be designed to comply with the following environmental conditions that may be encountered during the transportation, storage, and operation of the system.

3.2.2.1 Natural environment. The WMSCR shall be designed for the operating and non-operating environmental conditions listed in Table 2 (Note: Table 2 does not apply to commercial off-the-shelf equipment). All specification requirements for operating under service conditions shall be met when the equipment is operating at the specified duty cycle. Operating service conditions apply under all fixed or slowly varying conditions of AC line voltage and frequency defined in FAA-G-2100. Non-operating conditions include shipping and handling, storage, and installations that are not operating. If the equipment is designed to the non-operating condition, then design verification test results equal to or beyond these conditions must be available; if not, then protective containers and/or an environmental control system shall be provided so the stated non-operating condition is not experienced by the equipment.

3.2.2.2 Induced environment. The shock design requirements needed to withstand the commercial carrier transportation requirements shall follow MIL-STD-810. For unpackaged bench handling, the WMSCR hardware shall withstand a 4-in. pivoted drop and a 1-in. free drop from any possible direction.

3.2.3 Materials, processes, and parts. Procedures shall exist for the WMSCR off-the-shelf designs to manage corrosion, dissimilar metals, noxious materials, and material compatibility.

3.2.3.1 Corrosion. Corrosion control and monitoring shall address pertinent causes and preventive techniques presented in MIL-HDBK-721.

Table 2. The WMSCR Environment

Environment	Equipment Operating	Equipment Non-operating
Altitude	0 to 8,000 feet	0 to 50,000 feet
Temperature range	+10 to +40 degrees centigrade	-50 to +70 degrees centigrade
Humidity, % RH	10% to 80%	Up to 100% RH, non-condensing

3.2.3.2 Dissimilar metals.

3.2.3.3 Hermetic sealing. WMSCR hardware shall not consist of materials that are nutrients for fungi where it is practical to avoid them. When used and not hermetically sealed, such materials shall be protected against moisture and fungus with a fungus-resistant varnish. These tasks shall be performed in accordance with FAA-G-2100.

3.2.3.4 Parts.

3.2.4 Electromagnetic interference requirements. The WMSCR equipment shall meet the conducted and radiated emissions requirements of FCC Rules and Regulations, Part 15, subpart J, and of MIL-STD-461, Parts 1 and 7, as applicable to WMSCR when tested to MIL-STD-462. Modifications to MIL-STD-461, as applicable to WMSCR, are in Appendix IX.

3.2.5 Workmanship. WMSCR off-the-shelf equipment shall be manufactured, processed, tested, and handled so that finished items ensure reliable operation and safety throughout the 20-year service life. The items shall be free of defects that would interfere with operational use, such as scratches, nicks, burrs, loose materials, contamination, and corrosion. General workmanship shall be in accordance with MIL-STD-454, Requirement 9. Printed circuit assembly and printed wiring assembly workmanship shall be in accordance with ANSI/IPC-A-610, Class II.

3.2.6 Interchangeability. Interchangeability shall be in accordance with FAA-G-2100. The equipment shall be modular and standardized. Each WMSCR line replaceable unit (LRU) shall be physically, mechanically, structurally, and electrically interchangeable without modification, and without causing any unit to deviate from the requirements of this document.

3.2.7 Safety. The WMSCR system shall be compliant in all aspects with Occupational Safety and Health Administration (OSHA) Safety and Health Standards (29 CFR 1910).

3.2.8 Deployment requirements.

3.2.8.1 Production system deployment sites. Two WMSCR systems shall be developed. One production system shall be installed at each of the following locations:

(a) Salt Lake City NAWPF.

(b) Atlanta NAWPF.

(c) Leesburg Center (for NWID).

3.2.8.2 WMSCR production systems. The WMSCRs shall be deployed at the FAA-designated location within the NAWPF. In addition, NWID shall be installed in the FAA Leesburg, Virginia facility.

3.2.9 System effectiveness models. Any trade-off processes used in determining WMSCR design shall make use of effectiveness modeling to assess the potential value of proposed design alternatives. These models shall be developed at the system architecture level (1 and 2) and be extended to subsystem levels appropriate to each function being evaluated. The lowest level of concern for WMSCR is the single functionality or equipment level. The system effectiveness model shall be in accordance with the description in the prepublication edition by RADC of the MIL-HDBK-XXX, Electronic Reliability Design Handbook. System effectiveness shall be defined as the probability that a system can successfully meet an operational demand initiated at a random time when operated under the specified conditions.

3.2.10 Human performance/human engineering. The human engineering aspects of the WMSCR equipment design shall comply with MIL-STD-1472 where applicable.

3.2.11 Nameplates and nomenclature. Each equipment assembly that has a front panel, chassis, or enclosure shall have a nameplate. The design of the nameplate shall use FAA Drawing C-216 (FAA-G-2100, Figure 1) as a guide. Standard commercial practices for identification marking on hardware, products, content, and techniques shall be used for the identification, nomenclature, marking, and labeling of WMSCR system equipment. Individual nameplates shall be permanently affixed to the assemblies on an exposed surface area, other than operating panels and doors.

3.2.11.1 Serial numbers. Each piece of equipment with a nameplate and each LRU shall have a permanent serial number, in accordance with IEEE 200-75, starting with one and continuing up through the total number of such items supplied on the WMSCR contract.

3.3 Processing resources.

3.3.1 System elements. The WMSCR shall consist of two identical systems. One shall be located in the NAWPF building in Atlanta, Georgia, the other located in the NAWPF building in Salt Lake City, Utah. Each system is called a node. All system functional requirements shall be in accordance with section 3.1.4. The requirements defined below refer to the resources at each WMSCR node that are actively performing the on-line WMSCR functions of communications, product processing, data storage and retrieval, and system control.

3.3.1.1 General requirements.

3.3.1.1.1 Off-the-shelf. The WMSCR hardware shall consist only of off-the-shelf products.

3.3.1.1.2 Redundant equipment. Should the required availability be achieved through redundant equipment, the switchover to the standby unit shall be automatic and shall cause an interruption no longer than the 10 seconds defined in 3.1.4.4.1.3.1.2.

3.3.1.1.3 Growth requirements. The initially installed system shall have sufficient system components/resources to permit a 100% growth capability without enhancement, modification, or expansion of the operational WMSCR system components. In addition, the initially installed system shall have sufficient expansion capability through the addition of system components, but without any change in system design or any requirement for further software development, to support a 100-percent increase in communications connectivity and traffic to external users, a 100-percent increase in CPU processing power, a 400-percent increase in control terminals, and a 200-percent increase in data storage over that which is specifically required by other sections of this specification and the growth requirements stated in this section.

3.3.1.2 Central processor.

3.3.1.2.1 Processing speed. The processing capacity of the CPU shall be a system design option.

3.3.1.2.2 Main memory. The proposed equipment shall provide byte-addressable, error-correcting RAM memory. The memory size, access speed, and porting characteristics shall be system design options.

3.3.1.2.3 Word size. The word size shall be a system design option.

3.3.1 2.4 Character set standard. ASCII shall be provided as a standard character set. Capabilities for conversion between ASCII and EBDIC for interfacing external systems shall be provided.

3.3.1.2.5 Instruction set architecture. The instruction set architecture is a system design option.

3.3.1.2.6 Interrupt capabilities. The interrupt architecture shall be a system design option.

3.3.1.2.7 Direct Memory Access (DMA). DMA shall be a system design option.

3.3.1.3 Secondary storage. Secondary storage facilities shall provide a minimum on-line storage capacity at each node to achieve the duplicate data base requirement defined in 3.1.4.3.1.2.2(a). A minimum of two physical units are required.

3.3.1.4 Data channel requirements. Data channel architecture shall be a system design option.

3.3.1.5 Front-end communications processor. The proposed equipment shall be equipped with a front end communications processor or equivalent to perform physical, link, and network layer communication functions. The unit shall have the following minimum characteristics.

(a) Shall be programmable.

(b) Shall be modularly expandable.

(c) Shall support synchronous communications at rates up to 64 kbps on individual circuits.

(d) Shall support bit-orientated and byte-oriented link level protocols, in particular, X.25 LAPB and ANSI X3.66 (ADCCP).

(e) Shall support a minimum of 10 synchronous circuits with a 100-percent expansion capability.

(f) Shall have a interface conforming to RS-232 or RS-449/RS-422 hardware configurable. If the interfaces are not configurable, then five interfaces shall conform to RS-232 and five interfaces shall conform to RS-449/RS-422 and/or EIA-530.

3.3.1.6 Off-line storage for journal entries. The proposed equipment shall have a unit for reading and writing data to an off-line storage medium with the capability to store and retrieve off-line journal entries.

3.3.1.7 Video display terminals. Each WMSCR node shall have four Video Display Terminals (VDTs) used as general-purpose, operator-control terminals, plus two VDTs for software development and testing functions. Expansion to 16 VDTs shall be possible. The VDT shall consist of an alphanumeric Video Display Unit (VDU) and a detachable keyboard. Each VDT shall provide the capability to:

(a) Interactive WMSCR command entry.
(b) On screen data composition and editing.
(c) Support of software development and testing functions.

VDTs shall communicate with the CPU and communications front end using a serial, parallel, or direct channel attachment interface. At least one VDT shall communicate directly with the CPU to allow its use as a maintenance control position if the FEP should become inoperative. Table 3 defines the minimum requirements for the VDT.

3.3.1.8 Printers. Each WMSCR node shall be equipped with two types of printers: one high-speed line printer and five low-speed printers.

3.3.1.8.1 High-speed line printer. There shall be one high-speed line printer at each WMSCR node that will be used for volume printouts and program development. Table 4 outlines the required features.

3.3.1.8.2 Low-speed printer. There shall be five low-speed printers at each WMSCR node. These printers shall be logically associated with the four video display terminals. The fifth shall be used as a system event log printer. Table 5 outlines the required features.

3.3.2 System software requirements. The WMSCR system software shall consist of an operating system and associated software. The system software shall be off-the-shelf and unmodified.

3.3.2.1 System configuration. The operating system shall include an on-line configurator that shall permit the addition or deletion of peripherals to the system without system interruption.

3.3.2.2 Task management. The operating system shall support multitasking and multiprocessing operations. Multiple levels of priority shall be supported.

3.3.2.3 Memory management. The operating system shall manage all system memory.

3.3.2.4 Device management. All peripherals shall be supported by the operating system that shall provide a suitable high-level interface between the device and all applicable OTS and custom-designed applications programs.

3.3.2.5 File management. The system shall include a file management system that controls the storage of data on secondary storage. A file directory structure shall be an integral part of this feature.

3.3.2.6 Time management. The operating system shall maintain a real-time clock synchronized with the coded time source (CTS) and shall provide time of day and interval timer services.

3.3.2.7 System control. The system software shall include features for the initial and continuing control of the WMSCR functions.

3.3.2.7.1 Initiation/termination. The WMSCR shall provide the capability for operator control to initiate and terminate any process running on the provided hardware.

3.3.2.7.2 Performance monitoring. The operating system shall include features that shall permit the display of system performance and which shall report on resource utilization.

3.3.2.8 Development software. The proposed system software shall include program development capabilities that shall include all features and facilities used to develop the WMSCR application software. Using the provided system components the WMSCR shall provide for new WMSCR modules to be developed, tested, and integrated without interfering with active operations.

3.3.2.8.1 Compilers/assemblers/link editors. A macro assembler and a single, high-level structured language compiler shall be provided with the system-control software. A program link editor (if required) shall also be provided.

3.3.2.8.2 Debugger. A symbolic interactive debugger for use in software testing that is suitable for the provided compiler shall be furnished. Software development tools shall be supplied.

3.3.2.8.3 Program library maintenance system. A program library maintenance system shall be provided to organize and maintain all source codes.

Table 3. The WMSCR Video Display Terminal Attributes

Item No.	Feature	Requirement
1	Keyboard	Detached, standard typewriter layout (QWERTY), 20 function keys minimum
2	Display screen	12" diagonally measured CRT with 80 columns by 25 rows, scrolling, and variable intensity capability
3	Character set	Minimum subset 96 ASCII characters
4	Character attributes	Blink, underline, or high intensity, reverse character image
5	Cursor position	Cursor up, down, left, right, home, CR, backspace
6	Communication interface port	Full duplex transmission at a minimum rate of 9600 bps
7	Power requirements	115 Vac $\pm$10%, 60Hz $\pm$2%
8	Temperature of resident environment	4 to 40 degrees centigrade
9	Standard compliance	FCC Part 15, subpart J, Class A UL listed
10	Device reliability	10,000 hours MTBF minimum

Table 4. The WMSCR High-Speed Printer Attributes

Item No.	Feature	Requirement
1	Print type	General-purpose.
2	Print speed	Minimum 600 lines-per-minute for the specified character set.
3	Column width	132 columns with double tractor feed.
4	Character set	Minimum subset 96 ASCII characters.
5	Device Test	Local self-test.
6	Device controls	On-line/off-line, line feed, form feed, and self-test all operator accessible.
7	Power requirements	115 Vac ±10%, 60Hz ±2%.
8	Temperature of resident environment	4 to 40 degrees centigrade.
9	Standards compliance	FCC Part 15, subpart J, Class A UL listed.
10	Device reliability	2500 hours MTBF minimum.
11	Device noise	Less than 70dB(A) at 3 feet.

Table 5. The WMSCR Low-Speed Printer Attributes

Item No.	Feature	Requirement
1	Print type	General-purpose.
2	Print speed	Minimum 160 characters per second for the specified character set.
3	Line spacing	Function code controlled.
4	Columnar width	132 columns with double tractor feed.
5	Character set	Minimum subset 96 ASCII characters.
6	Device test	Local self-test.
7	Device controls	On-line/off-line, line feed, form feed, and self-test all operator accessible.
8	Power requirements	115 VAC ±10%, 60hz ±2%.
9	Temperature of resident environment	4 to 40 degrees centigrade.
10	Standards compliance	FCC part 15, subpart J, class A, UL listed.
11	Device reliability	5000 hours MTBF minimum.
12	Device noise	Maximum 65 dB(A) at 3 feet.

3.3.2.9 Diagnostic software. A full complement of hardware diagnostic programs shall be provided. These programs shall isolate a hardware failure to the LRU. Diagnostics for all provided equipment and peripherals shall be furnished.

3.3.3 Design and coding constraints. This section specifies the software design and coding constraints under which the custom-designed software shall be designed and implemented. It also specifies design constraints OTS software must adhere to.

3.3.3.1 Software design requirements. All WMSCR software shall be designed in accordance with the requirements in this specification. The software design shall accommodate the following requirements:

a. Identical software (adaptable to the local resources, environment, and workload) shall be installed at each site.

b. Design emphasis shall be placed on reliability, error detection, fault tolerance, and recovery from abnormal conditions. Techniques used to meet this requirement may include, but are not limited to, formal verification of critical software, continuous checking for data consistency, redundant software for essential functions, and duplicate storage of data and programs.

c. The design shall support system modification, enhancement, and expansion throughout the expected lifetime of the WMSCR.

d. The software design shall provide logical and physical data independence. Changes made to the logical structure of the data shall not impact the application programs. Changes made to the physical structure of the data shall not impact the logical structure of the data or the application programs.

e. The software design shall provide data integrity. It shall protect data from accidental loss or damage.

3.3.3.1.1 Software design considerations. All WMSCR software shall be designed with consideration to the following:

(a) Identification and authentication.

(b) Controlled access.

(c) Operating system integrity.

(d) Residue cleanout.

(e) Audit trails and trace routines.

(f) The software design shall protect data from operational abuse, theft, and unauthorized use.

(h) The software design shall provide a common and controlled approach to adding new data, and to modifying and retrieving existing data.

(i) The software design shall ensure that the system is initialized to a correct, internally defined, and operationally ready state upon recovery from a fault and that all processing interrupted by a fault is properly resumed after recovery.

(j) The software design shall incorporate the commercially available operating system that is applicable to the processing elements and consistent with the selected design and architecture, along with commercially available compiler, loader, librarian, and other debug and utility tools.

3.3.3.1.2 Design unit attributes. The WMSCR software design or software architecture shall be functionally and operationally modular to:

a. Facilitate system expansion, modification, and configuration control.

b. Enhance system reliability by facilitating fault detection, diagnosis,containment, recovery, and fault-tolerant behavior.

c. Facilitate data base changes to the lowest practical level without large program reassemblies.

Each unit shall perform a single unique function, with inputs, outputs, and intermodular interfaces clearly defined. Each unit shall be separately compilable. Each unit shall consist of a specification part, data declarations, and sequence of statements. The specification part shall contain the information necessary to use the unit. The data declarations shall define logical entities needed by the module. The sequence of statements shall define operations to be performed. Only statements within a unit shall access private data-types of that unit. Other units shall access data through interfaces provided by this unit.

3.3.3.1.3 Design representation. The design shall be represented in a manner that facilitates traceability to the specification, ease of understanding, and ease of design implementation. The representation shall be maintained as part of the design data base. The WMSCR design representation shall:

a. Provide a natural expression of the control constructs specified for code development.

b. Be compatible with the properties and facilities of the target language candidates and their automated tool implementations.

c. Facilitate a precise specification of the design and impose a rigorous structure on the design.

d. Be directly processable by the tools specified in 3.3.3.1.4 to facilitate the anaylsis provisions noted and to enable standards enforcement to be accomplished.

e. Be comprised of successive, independent levels of abstraction with an independent set of objects and the operations on these objects defined at each level.

f. Explicitly document design decision with high-order decisions not affected by low-level implementation.

g. Be expressed in such a way that programmers receive only that information needed to complete a unit and users receive only that information needed to use a unit.

h. Provide formal, testable unit specifications with design decisions decoupled and encapsulated, interfaces explicitly defined, and complete documentation of dependencies.

3.3.3.1.4 Special design tools and techniques. Design support tools shall be used to record, analyze, and maintain the WMSCR software design. These tools shall provide:

a. Traceability of software system components to software requirements.

b. Configuration control and tracking of changes in the design and software requirements.

c. Completeness and consistency testing of all software units.

d. Modeling and simulation to support processing resource allocations and to predict system performance under varying work loads, as required.

e. The means to verify adherence of the design to software design standards.

f. The means to indicate in the design representation that a design feature is incomplete and, later, to identify and track all such incomplete design features.

g. Various printed outputs such as source listings, error lists,cross-reference lists, flow charts, hierarchy charts, design change history logs, extensive external code documentation manuals (organized for flexible and precise reference), and any other documentation required to validate the WMSCRs program design.

The tools shall be applicable throughout the software development and maintenance life cycle. They shall address all aspects of operational software design, including data structures, files, and interfaces. The tools shall encourage and facilitate design of software in accordance with the contractor-supplied Software Quality Assurance Plan.

3.3.3.2 Software development. All software specifically developed for WMSCR shall be implemented in a single, High-Order Language (HOL) with structured attributes consistent with the requirements in 3.3.3.2.1. Assembler language shall be permitted only in those limited cases where the HOL is unable to provide the desired functionality.

3.3.3.2.1 Unit attributes. Structured programming techniques shall be employed. All units shall be implemented with one entry and one exit, with the exception of error conditions. Only structured HOL shall be utilized. All program units shall have the following additional attributes:

a. A program unit shall contain the code required to implement a single, well-defined function and shall not exceed, on the average 100 executable, non-expandable high-order language statements, or at most 200 executable, non-expandable high-order language statements.

b. All source codes shall be indented to clearly denote logical levels of constructs for ease of visual inspection.

c. All segments shall have sufficient annotation, i.e., comments, to explain inputs, outputs, branches, and other items not obvious in the code itself. Explanatory notes shall be uniformly indented.

d. Statements shall be grouped and arranged in a meaningful order in the code, e.g., columnar rather than a horizontal string.

e. Data declarations shall be grouped and arranged in a meaningful order in the code, e.g., columnar rather than a horizontal string.

f. Data names and procedure labels shall be meaningful in that labels shall be suggestive of their function.

g. Each line of source code shall contain one statement only.

h. Formats for error and diagnostic messages shall be standardized and shall require no additional interpretation such as table lookups.

i. Loop indexes shall not be altered during loop execution.

j. Unnecessary assignment of a constant value to a variable (especially within a loop) shall not be made.

k. Code shall be written so that no code can be modified during execution.

l. Units shall not share temporary storage locations of variables.

m. Each unit shall be uniquely identified.

n. Except for error exits, each unit shall have a single entry point and a single exit point.

o. Complicated expressions, such as compounded negative Boolean expressions and nesting beyond five levels, shall not be used.

3.3.3.2.2 Use of commercial and reusable software. The use of any commercially procured software or software developed for other applications (reusable software) shall be confined to that which has been demonstrated to meet the performance criteria, reliability, maintainability, availability, testing, and documentation requirements as stated in the Statement of Work (SOW) and this document.

3.4 Quality factors.

3.4.1 Reliability. The WMSCR shall achieve a nodal Mean Time Between Failure (MTBF) of 1,666 hours, minimum, for critical equipment.

3.4.1.1 Design reliability. Design reliability emphasis for the WMSCR is primarily directed to off-the-shelf, proven designs. For an off-the-shelf design to be designated a proven design, there must be adequate substantiating data, from field use or test, obtained under operating environments similar to that specified for WMSCR.

3.4.1.2 Design policy. The following design policies shall be applied.

3.4.1.2.1 Single-point failures. The WMSCR design shall avoid possible occurrence of single-point failures that impede or prevent the accomplishment of required system functions.

3.4.1.2.2 Propagation of primary failures. The WMSCR shall be designed so that the primary failure of a component does not cause subsequent failure of other components.

3.4.1.2.3 Backup equipment. Reliability shall be increased by the use of backup equipment, where appropriate. The WMSCR shall have no performance degradation when backup equipment is switched on-line.

3.4.1.2.4 Functional independence. The WMSCR design shall minimize functional interdependency of separate components.

3.4.1.2.5 Controlled degradation. Where functional interdependencies do exist, the WMSCR design shall attempt to allow, after the loss of a functionality, only controlled degradations of other functionalities. A degradation can be considered controlled if WMSCR may still perform all its functions, although at an up to 10-percent reduced rate or volume.

3.4.2 Maintainability. Maintainability is the ability of a WMSCR node to be retained in or restored to specified conditions when maintenance is performed by personnel having specified skill levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair. The WMSCR shall achieve a nodal Mean Time to Repair (MTTR) of 0.5 hours, maximum, for critical equipment.

3.4.2.1 Maintainability policy. The design of the WMSCR shall be compatible with the logistics maintenance concept set forth herein. Equipment utilized in the WMSCR shall be designed to expedite restoration of a system function interrupted by a failure through removal of a readily replaceable modular element containing the faulty element; this replaceable modular element is designated as the Line Replacement Unit (LRU). The system shall incorporate automatic fault-isolation capabilities in the form of built-in test equipment/ built-in test (BITE/BIT) and/or external test equipment utilizing test points such that 85 percent of all failure occurrences can be isolated to the single faulty LRU, and 95 percent to no more than two LRUs. On-site WMSCR preventive maintenance tasks shall be required no more than once every 90 days, as specified in FAA Order 6000.30, Airway Facilities Service Policy Decisions for the Maintenance Program of the 1980s.

3.4.2.2 Design constraints.

3.4.2.2.1. Service and access. For all WMSCR equipment, design for ease of servicing and access shall be in accordance with paragraphs 5.9, 5.10, 5.11, and 5.13 of MIL-STD-1472. All major components (equipment) or modules shall be completely removable from their enclosure with minimum feasible disassembly. All test points shall be accessible without disassembly of the equipment. The equipment shall be designed to permit module replacement without removal of adjacent modules. Calibrations and adjustments shall be accomplished through the use of either built-in meters and gauge or portable test instruments. When safety allows, access shall be provided to modules from outside the basic equipment through the use of swing-out units, pull-out drawers with drawer slides, cable extenders and cable retractors, and circuit-card extenders, to allow module operation in the open position. The variety and number of special tools and test equipment to maintain the equipment shall be held to a minimum.

3.4.2.2.2 Test points. All WMSCR equipment not covered by built-in test equipment or testable by diagnostic software shall provide test points and facilities for connecting external test equipment for determining performance quality of the equipment. Test points shall be in accordance with MIL-STD-415.

3.4.2.3 Modularity. All equipment shall be designed to be modular, and the number of unique module types shall be kept to a minimum. Plug-in modules shall be standardized to permit interchangeability of similar modules without alignment or adjustment. All modules shall be keyed to prevent incorrect installation and/or incorrect interconnection.

3.4.2.4 Monitoring requirements. The WMSCR shall have both automated self-monitoring capabilities and operator-initiated monitoring capabilities. WMSCR shall automatically and constantly evaluate the operational status of each hardware component and each software element corresponding to the major system functions. Any anomaly shall be reported to the operator via the system event log and also to the MPS via the WMSCR/MPS interface. The status of any hardware element and the status of any software element shall be displayed on the operator control terminal within 15 seconds following an operator request.

3.4.3 Availability. Availability shall be defined as the probability that a WMSCR node will be in a state capable of meeting its functional requirements when it is called upon at a random time, exclusive of the effects of any logistics or administrative delays. It is affected by failure rates, backup equipment strategies, repair times and strategies, and effects of preventive maintenance. The WMSCR inherent availability at a node shall not be less than 0.9997, excluding non-critical equipment and excluding FAA-supplied air conditioning and power.

3.4.4 Transportability. Each equipment item fabricated or procured for the WMSCR system shall, in its packed-for-shipment configuration, be capable of being transported via common surface or air carriers. Size, weight, and other physical characteristics shall be consistent with the provisions of section 3.2.1 and section 5.

3.4.5 Additional quality factors. The WMSCR quality control and computer software quality control shall be in accordance with the requirements of FAA-STD-013 and FAA-STD-018.

3.5 Logistics.

3.5.1 Maintenance.

3.5.1.1 Maintenance concept. A three-level maintenance concept will be employed for the WMSCR. These three levels are: (1) site (organizational), (2) shop (intermediate), and (3) depot. The locations at which the respective maintenance tasks will be performed are: (1) the NAWPF, (2) the sector repair center (SRC), and (3) the FAA depot/Original Equipment Manufacturer (OEM).

3.5.1.1.1 Site (NAWPF)-level maintenance. Maintenance is performed at this level on systems, subsystems, and support equipment in direct support of NAWPF operations. It includes system maintenance monitoring, system fault isolation, and correction of system failures through the removal and replacement of Line Replaceable Units (LRUs), but does not include disposition, repair, service, calibration, and verification of the removed LRUs. Removed LRUs will be forwarded to the SRC.

3.5.1.1.2 Sector Repair Center (SRC)-level maintenance. Maintenance is performed at this level in direct support of site-level maintenance and involves disposition, repair, service, calibration, and verification of items removed during site maintenance. It normally excludes activities requiring equipment, facilities, or skills that can be provided more economically at the depot level.

3.5.1.1.3 Depot-level maintenance. This level of maintenance includes the responsibility for repair of LRUs, such as printed circuit boards, which are beyond the economic or skill capability of the shop maintenance level.

3.5.1.1.4 LRU definition. An LRU is a repairable unit consisting of a combination of components, parts, assemblies, subassemblies, etc., which, when removed and replaced, will restore the larger entity within which it operates to an operational configuration. It excludes items falling under the definition for a repair/piece part.

3.5.1.2 Support and test equipment (S&TE). S&TE shall be identified and documented in accordance with the Statement of Work.

3.5.1.2.1 System-level test equipment. The test equipment necessary for system maintenance, i.e., fault isolation down to the LRU level, shall be kept to a minimum. These functions shall be primarily represented by built-in test diagnostics and equipment with WMSCR.

3.5.2 Supply. The WMSCR design shall make maximum use of standard, approved parts already in the government inventory.

a. The spares provisioning shall fully consider use of the FAA system for supply support and spares control action.

b. The results of past data, reflecting manufacturer's support recommendations/experience for off-the-shelf equipment, and experience with similar equipment, shall be the basis for provisioning decisions.

c. Spare/repair parts shall be provisioned, positioned, and time-phased to production in adequate range and quantity to provide full support concurrent with WMSCR prime mission equipment delivery. Initial provisioning shall include support for all levels of maintenance and repair.

3.5.3 Support facilities. The WMSCR will be installed in existing NAWPF facilities located at Salt Lake City, Utah, and Atlanta, Georgia. Installation shall not require modification of existing facilities. Quantitative requirements, in sufficient detail, shall be developed for usage of existing facilities and equipment so that availability may be verified.

3.5.4 Personnel.

3.5.4.1 Maintenance personnel. There are four major maintenance functions (monitoring, diagnostic, repair, and preventive maintenance) that must be quantified and supported by maintenance personnel per FAA delineation of personnel levels. The WMSCR shall be maintainable by personnel defined by these levels:

(a) Developmental Specialist: An uncertified technician who performs maintenance tasks at the site, shop, or depot level.

(b) Systems Specialist: A certified technician who performs maintenance tasks at the site, shop, or depot level.

(c) Systems Analyst: An analyst who provides the in-depth system skills necessary to diagnose and resolve complex and difficult problems related to a specific system and its interfaces. These analytical and trouble-resolving skills would be beyond those expected of a systems specialist.

(d) Systems Engineer: An engineer who provides systems management and control for all systems and provides the broadest range of systems knowledge and expertise to ensure real-time quality control and system integrity.

3.5.5 Training. Training of FAA personnel for WMSCR shall be accomplished in accordance with the Statement of Work and FAA-STD-028, FAA Standard for Contract Training Programs.

3.6 Precedence. The order of precedence of the various requirement categories identified in the following is intended to be applied in making requirement, design, and implementation related trade-offs. The establishment of these precedence categories does not imply that it is acceptable not to meet certain of the requirements contained in the WMSCR specification. Unless specifically waived in accordance with applicable WMSCR configuration management procedures, all requirements expressed herein shall be met.

3.6.1 Intrinsic system capabilities. Of highest priority for achievement are those requirements which mandate the presence of an intrinsic system capability that is generally verifiable without the necessity for extensive analysis. An example of such a requirement is the addition of headers to outgoing products.

3.6.2 Inter-system independence. This second priority of design characteristic means that the WMSCR must be designed and built in such a manner that it avoids adverse impact on the other elements of the NAS.

3.6.3 Performance standards. The third priority is the accommodation of those requirements that define quantitative (but also often qualitative) standards of performance of what are generally intrinsic system capabilities.

3.6.4 Design goals. Of lowest priority are those requirements that specify design goals, features that relate primarily to non-quantifiable or subjective aspects of ease-of-use or operability, or desired characteristics of the WMSCR that cannot be directly related to the attainment of any of the higher priority requirement categories.

3.7 Configuration management requirements. WMSCR configuration management shall be in accordance with FAA-STD-021. Configuration management methods applied to software shall also be in accordance with DOD-STD-2167, Defense System Software Development, as applicable.

4.0 TEST REQUIREMENTS

4.1 General. This section describes the aspects of WMSCR testing, proposed test locations, test responsibilities, qualification methods, test levels, requirements, quality conformance requirements, and content and use of the Qualification Cross-Reference Table.

4.1.1 Philosophy of Testing. The WMSCR shall be tested in a series of tests that demonstrate, verify, and validate:

(a) compliance with all functional and performance requirements stated in this specification

(b) operability of the WMSCR under a wide range of required situations

(c) utilization of the WMSCR by the users.

WMSCR testing shall be based on a bottom-up, buildingblock approach that takes a defined subset of WMSCR requirements and validates compliance of that building block with its requirements before proceeding to validate the next higher level of integration. Major test series shall progress from the module level, to the component level, to the subsystem level, and up to the system test level. Special test requirements shall be developed to accommodate each test phase. The functional capabilities of each successive building-block increase until the final building-block implements all WMSCR system requirements.

4.1.2 Test levels. WMSCR testing shall be structured in the following major categories:.

a. Unit Test (UT). UT shall consist of software module and component-level design qualification tests prior to delivery of configuration items to Systems Integration Test.

b. Systems Integration Test (SIT). SIT shall consist of configuration item (CI and CSCI) integration testing and shall include system function, performance, and support tests.

c. Factory Acceptance Test (FAT). FAT shall consist of pre-shipment, system-level testing.

d. Site Acceptance Test (SAT). SAT shall consist of post-shipment, system-level testing and shall include operational suitability tests.

4.1.2.1 Unit test. The Unit Test (UT) shall demonstrate the operation of individual components or modules. UT serves to verify functional performance, data flow, and interface requirements.

4.1.2.2 SIT. The Systems Integration Test (SIT) shall demonstrate the successful concurrent operation of from 2 to all WMSCR Configuration Items (CI), Computer Software Configuration Items (CSCI), and subsystems in the contractor's SIT facility environment (or equivalent). The complete WMSCR configuration shall be tested using an environment that simulates the external environment anticipated by the FAA (refer to section 3.1.4.5.2). A Test Readiness Review (TRR) shall be conducted prior to the SIT. The SIT plan shall define the input data, initialization requirements, expected output data, and evaluation criteria. Testing resources such as personnel, equipment, facilities, and schedules shall also be detailed.

4.1.2.3 FAT. This test (otherwise known as a pre-shipment system test) shall be performed to validate the function of the system at the contractor's test facility and will be witnessed by the FAA. The FAT shall demonstrate the adequacy of the WMSCR design by testing all aspects of system function and performance, as defined in the system specification. The FAT plan shall define the range of tests, input data, initialization requirements, expected output, and test success criteria. Testing resources such as personnel, equipment facilities, and schedules shall also be identified. Upon the successful completion of the FAT, each WMSCR shall be transported to and installed at its intended field environment.

4.1.2.4 SAT. This test (otherwise known as a post-shipment system test) shall be performed to validate the function and performance of the system (previously demonstrated by the FAT at the contractor's test facility) in its intended field test environment. This test shall use all available actual field stimuli and inputs. Field inputs not available shall be simulated. Following the successful completion of the SAT, each WMSCR shall be ready for FAA Operational Test and Evaluation (OT&E). The SAT plan shall present descriptions and test success criteria for transferring the WMSCR systems from the contractor's test environment to the FAA NAWPFs and for checkout testing. This test plan shall define the range of tests, input data, initialization requirements, expected output, and criteria for evaluating test results. Testing resources such as personnel, equipment, facilities, and schedules shall also be identified. System performance testing for the SIT, FAT, and SAT shall be performed under:

(1) Normal data flow and normal operating conditions.

(2) Limit and overload conditions.

(3) Erroneous data input and abnormal operating conditions.

(4) Failure and recovery conditions.

4.1.3 Quality conformance requirements. Each test plan shall delineate each specific WMSCR requirement to be demonstrated during the test. Included with each requirement shall be an indication of the method to be used to demonstrate the requirement, the expected output or results, and how the results will be analyzed to determine success or failure. In each formal test

procedure, the requirement identification shall be noted at the beginning of the procedure steps that test the requirement. Requirement identification shall consist of the number used in Section 3 of this specification. Each test report shall contain a section that delineates all requirements demonstrated during the test, followed by an indication of the actual output or results and a statement concerning the success or failure of the demonstration. The Qualification Cross-Reference Table described in 4.3 shall be a progressive and ongoing table included and maintained in formal test plans. The corresponding test report for each test plan shall include the table updated to reflect the relative completeness of requirement satisfaction and the deviations necessary to proceed to the next level of test activities.

4.2 Test constraints.

4.2.1 Physical configuration. The physical configuration of the WMSCR shall remain the same during FAT and SAT testing.

4.2.2 Equipment movement. DELETED.

4.3 Qualification cross-reference table. The following is a methodology used to verify adherence to requirements specified in Section 3. The verification methods include inspection, analysis, demonstration, and test. Each requirement and method of verification shall be presented in tabular form, as shown in Table 8.

4.3.1 Implementation of verification methods. These verification requirements shall be mandatory for use in all testing of the WMSCR. Where applicable, pass/fail criteria for each verified requirement shall be defined and placed in the appropriate documentation. Failure to "pass" the appropriate verification action(s) (inspection, analysis, demonstration, or test) shall be cause for rejection. No adjustments to the equipment shall be allowed during verification. Upon evaluation of the cause of the failure and the implementation of proper corrective measures, the verification in which the failure occurred shall be repeated. If the corrective action has affected prior verifications, if a computer program is changed, or if any hardware is changed, then the prior verification shall be repeated. Each verification method is detailed in the following sections.

4.3.1.1 Inspection (I). Inspection is verification by visual examination of the item, without the use of special laboratory equipment or procedures. It involves a review of descriptive documentation and comparison of the appropriate characteristics with a predetermined or referenced standard to determine conformance to requirements.

4.3.1.2 Analysis (A). Analysis is verification by technical/mathematical evaluation or simulation using mathematical representation (i.e., mathematical nodels, algorithms, equations), charts, graphs, circuit diagrams, data reduction/recording and representative data to prove that an item meets specified requirements. Representative data may include data collected from previous or other equipment and system verifications.

4.3.1.3 Demonstration (D). Demonstration is an uninstrumented test, where success is determined from observation alone. Included in this category are tests whose results can easily be determined on a pass-fail basis.

4.3.1.4 Test (T). Test is verification, through systematic exercising of the system under all appropriate conditions with collection, analysis, and evaluation of quantitative data for predetermined performance characteristics. Acceptability of the item is determined by the comparison of the data with pre-established quantitative requirements and occurrences.

4.3.1.5 External Interface Verification (*). The method of verification of external interface requirements of the WMSCR shall be in accordance with the Verification Requirements Traceability Matrices (VRTMs) of the referenced IRDs.

Table 6. Qualification Cross-Reference Table

Paragraph	Paragraph Name	Method
3.	REQUIREMENTS	-
3.1	System definition	-
3.1.1	Missions	-
3.1.2	Threat	D
3.1.3	System modes and states	-
3.1.4	System functions and system performance requirements	-
3.1.4.1	Communications function	-
3.1.4.1.1	Network Configuration Data Base (NCDB)	-,D
3.1.4.1.2	Communications data storage	I
3.1.4.1.2.1	Interfaces to data communications storage function	I,D
3.1.4.1.2.2	Priority data communications storage	I,D
3.1.4.1.2.3	Resiliency to system failure	D
3.1.4.1.2.4	Communication storage configuration	D
3.1.4.1.2.5	Obsolete weather data deletion	D
3.1.4.1.2.6	Storage retention limit	D
3.1.4.1.2.7	Alternate destination assignment	D
3.1.4.1.2.8	Return to storage capability	D
3.1.4.1.2.9	Capacity of communications data storage	A,D
3.1.4.1.3	Communications function interface with other WMSCR functions	-
3.1.4.1.3.1	Control function interface	-
3.1.4.1.3.2	Processing function interface	I,-
3.1.4.1.4	WMSCR external interfaces	-
3.1.4.1.4.1	WMSCR/WMSCR interface	I,D
3.1.4.1.4.2	WMSCR/NADIN PSN interface	-
3.1.4.1.4.3	WMSCR/NWSTG interface	D
3.1.4.1.4.4	WMSCR/AWP interface	D
3.1.4.1.4.5	WMSCR/CNSP interface	D
3.1.4.1.4.6	WMSCR/RWP interface	D
3.1.4.1.4.7	WMSCR/Packet network users interface	D,-
3.1.4.1.4.8	WMSCR/Asynchronous Packet Assembler Disassembler (PAD) user interface	D,-
3.1.4.1.4.9	WMSCR/Maintenance Processor Subsystem interface	D,-

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.1.4.1.4.10	WMSCR/ADAS interface	D
3.1.4.1.4.11	WMSCR/Message switch network users interface	D
3.1.4.1.4.12	WMSCR/WCP Interface	D
3.1.4.1.4.13	WMSCR/TMP interface	D
3.1.4.1.4.14	WMSCR/CTS interface	D
3.1.4.2	Processing function	D,I,-
3.1.4.2.1	Product Information Data Base	I,-
3.1.4.2.1.1	Organization of the Product Information Data Base	D,I-
3.1.4.2.1.2	PIDB entries	D
3.1.4.2.2	Identification and validation	-
3.1.4.2.2.1	Data identification	I,D
3.1.4.2.2.1.1	Universal Product Identifier	I,D
3.1.4.2.2.1.2	UPI organization	D
3.1.4.2.2.1.3	UPI subformats	I
3.1.4.2.2.1.3.1	Data in WMO format	I,D
3.1.4.2.2.1.3.1.1	Messages in ICAO format	I,D
3.1.4.2.2.1.3.1.2	ADAS formats	D
3.1.4.2.2.1.3.2	Data in FCM-S2	D
3.1.4.2.2.1.3.3	Data request formats	D
3.1.4.2.2.1.4	Universal Report Identifier (URI)	I,D
3.1.4.2.2.1.5	URI organization	T
3.1.4.2.2.2	Data validation	I,D
3.1.4.2.2.2.1	Data in WMO format	I,D,T
3.1.4.2.2.2.2	Data in FCM-S2	D
3.1.4.2.2.2.3	Data in AWOS format	D
3.1.4.2.2.2.4	Collective verification	D
3.1.4.2.2.2.5	NOTAM reports	D
3.1.4.2.3	Data editing	I
3.1.4.2.3.1	Error presentation	D
3.1.4.2.3.2	Error correction	D
3.1.4.2.3.3	Corrected data resubmission	D
3.1.4.2.4	Product distribution	D,I
3.1.4.2.4.1	Distribution based upon product identification	D
3.1.4.2.4.2	Distribution based upon source	D,-
3.1.4.2.4.3	Distribution of data request responses	D
3.1.4.2.4.4	Distribution determined by operational status	-,D
3.1.4.2.4.5	Routing loopback prevention	D
3.1.4.2.4.6	Distribution determined by communication data storage status	D
3.1.4.2.4.7	Distribution determined by validation error	D
3.1.4.2.5	Product assembly	D
3.1.4.2.5.1	Scheduled product assembly	D
3.1.4.2.5.2	Arrival triggered product assembly	D
3.1.4.2.5.3	Product assembly data base (PADB)	I

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.1.4.2.5.3.1	Schedule	D
3.1.4.2.5.3.1.1	Day-of-week selection	D
3.1.4.2.5.3.1.2	Temporary entries	D
3.1.4.2.5.3.1.3	Entry suppression	D
3.1.4.2.5.3.2	Format definition	I,D
3.1.4.2.5.3.2.1	Static text	D
3.1.4.2.5.3.2.2	Variables	D
3.1.4.2.5.3.2.3	Product and report references	D,I
3.1.4.2.5.3.3	Missing weather data	D
3.1.4.2.6	Processing performance	-
3.1.4.2.6.1	Data identification, validation, and distribution performance	T,-
3.1.4.2.6.2	Product assembly performance	T
3.1.4.3	Storage and retrieval function	D
3.1.4.3.1	Weather and NOTAM data base(s)	-
3.1.4.3.1.1	Data base organization	I
3.1.4.3.1.1.1	Static data base	-
3.1.4.3.1.1.1.1	Product Information Data Base	I,D
3.1.4.3.1.1.1.2	Station Information Data Base	D,-
3.1.4.3.1.1.2	Dynamic data base(s)	I,-
3.1.4.3.1.1.2.1	Dynamic product data base	I,D
3.1.4.3.1.1.2.2	Dynamic report data base(s)	D,I
3.1.4.3.1.2	Data base requirements	-
3.1.4.3.1.2.1	Data base reorganization	I
3.1.4.3.1.2.2	Duplicate data base(s)	D
3.1.4.3.1.2.3	Survival on system failure	D
3.1.4.3.1.2.4	Internodal data base transfer	D
3.1.4.3.2	Data storage	D
3.1.4.3.2.1	Product storage	D,-
3.1.4.3.2.2	Report storage	D
3.1.4.3.2.2.1	Universal Report Identifier (URI)	D
3.1.4.3.2.2.2	Collective breakdown	D
3.1.4.3.2.2.2.1	Collective breakdown adaptation data base	D
3.1.4.3.2.2.2.2	Collective breakdown general procedures	D
3.1.4.3.2.2.2.3	Collective breakdown specific procedures	D
3.1.4.3.2.2.2.4	Collective breakdown verification	D
3.1.4.3.2.2.2.4.1	Duplicate weather report check	D
3.1.4.3.3	Data retrieval	D
3.1.4.3.3.1	General requirements	-
3.1.4.3.3.1.1	Retrieval function modularity	I

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.1.4.3.3.1.2	Textual retrieval language	D,-
3.1.4.3.3.1.2.1	Table defined textual retrieval language	I,D
3.1.4.3.3.1.2.2	Textual retrieval language interactive capability	D,I
3.1.4.3.3.1.3	Retrieval Security	D
3.1.4.3.3.1.4	Request Identification	D,-
3.1.4.3.3.1.5	Data response ADU	D
3.1.4.3.3.1.6	Data request reject ADU	D
3.1.4.3.3.2	Weather product retrieval functions	D
3.1.4.3.3.2.1	Specific UPI	D
3.1.4.3.3.2.2	Date/time-range	D
3.1.4.3.3.2.3	Latest version	D
3.1.4.3.3.2.4	Multiple retrieval	D
3.1.4.3.3.2.5	Multiple criteria	D
3.1.4.3.3.3	Weather and NOTAM report retrieval functions	D
3.1.4.3.3.3.1	Specific URI	D
3.1.4.3.3.3.2	Specific NOTAM URI	D
3.1.4.3.3.3.3	Station weather report retrieval	D
3.1.4.3.3.3.4	Station NOTAM report retrieval	D
3.1.4.3.3.3.5	Time-range report retrieval	D
3.1.4.3.3.3.6	Latest version weather report retrieval	D
3.1.4.3.3.3.7	Latest version NOTAM report retrieval	D
3.1.4.3.3.3.8	Multiple weather and NOTAM report retrieval	T,D
3.1.4.3.3.3.9	Multiple criteria weather and NOTAM report retrieval	D
3.1.4.3.3.3.10	Station set weather report retrieval	D
3.1.4.3.3.4	Retrieval users	D
3.1.4.3.3.4.1	External users	I
3.1.4.3.3.4.1.1	RWP data requests	D
3.1.4.3.3.4.1.2	AWP data requests	D
3.1.4.3.3.4.1.3	Network user data requests	D
3.1.4.3.3.4.1.4	Leased Service A system data requests	D
3.1.4.3.3.4.1.5	Airline user data requests	D
3.1.4.3.3.4.1.6	Message switch network user data requests	D
3.1.4.3.3.4.1.7	WCP data requests	D
3.1.4.3.3.4.1.8	CNSP data requests	D
3.1.4.3.3.4.1.9	TMP data requests	D
3.1.4.3.3.4.2	Internal retrieval	-
3.1.4.3.3.4.2.1	Data retrieval by internal data assembly	D
3.1.4.3.3.4.2.2	Operator data retrieval	D
3.1.4.3.4	Data deletion	D,-
3.1.4.3.4.1	Product deletion	D

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.1.4.3.4.2	Report deletion	D
3.1.4.3.4.3	NOTAM report deletion	D
3.1.4.3.4.4	Communications data storage deletion	D
3.1.4.3.5	System journal	T,D
3.1.4.3.5.1	Journal contents	D,T
3.1.4.3.5.2	Journal transfer	D,T
3.1.4.3.5.3	Journal utility functions	D,I
3.1.4.3.5.3.1	Selective product printing	D,T
3.1.4.3.5.3.2	Selective report printing	D,T
3.1.4.3.5.3.3	Selective system event-log printing	D
3.1.4.3.5.3.4	Traffic analysis	D,-
3.1.4.3.5.3.5	Data analysis	D
3.1.4.3.5.3.6	System performance analysis	D
3.1.4.3.5.3.7	Reporting station history	D
3.1.4.3.6	Data storage and retrieval performance requirements	-
3.1.4.3.6.1	Product storage	T,I
3.1.4.3 6.2	Report storage	T,I,-
3.1.4.3.6.3	Data retrieval	I
3.1.4.3.6.3.1	Product retrieval performance	T
3.1.4.3.6.3.2	Report retrieval performance	T
3.1.4.3.6.4	Weather data deletion	T
3.1.4.3.6.5	NOTAM data deletion	T
3.1.4.4	Control function	-
3.1.4.4.1	Automatic system control	I,D
3.1.4.4.1.1	Normal operation	D,-
3.1.4.4.1.1.1	Overall automated control	D
3.1.4.4.1.1.2	Communications control	I,D,-
3.1.4.4.1.1.3	Processing control	I
3.1.4.4.1.1.4	Storage control	I
3.1.4.4.1.2	Internodal coordination	D
3.1.4.4.1.2.1	Overall status coordination	D,I,T
3.1.4.4.1.2.2	Input data coordination	D,T
3.1.4.4.1.2.3	Output data coordination	D
3.1.4.4.1.2.4	NCDB coordination	D
3.1.4.4.1.2.5	PIDB coordination	D
3.1.4.4.1.2.6	PADB coordination	D
3.1.4.4.1.2.7	Data base coordination	D
3.1.4.4.1.2.8	Other coordination	D
3.1.4.4.1.2.9	Internodal data base utility	D
3.1.4.4.1.2.9.1	Dynamic data base replenishment	D
3.1.4.4.1.2.9.2	Dynamic data base comparison	D,T,I
3.1.4.4.1.2.9.3	Static and adaptation data base replenishment	D

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.1.4.4.1.3	Failure operation	-,D
3.1.4.4.1.3.1	Failure within a node	D
3.1.4.4.1.3.1.1	Software failure	I,D,T
3.1.4.4.1.3.1.2	Hardware failure	D,T,I
3.1.4.4.1.3.1.2.1	Critical equipment	I,D,T
3.1.4.4.1.3.1.2.2	Non-critical equipment	D
3.1.4.4.1.3.1.3	Electrical and environmental equipment failure	D,A
3.1.4.4.1.3.2	Complete nodal failure	D,T
3.1.4.4.1.3.2.1	Failure detection and notification	D
3.1.4.4.1.3.2.2	Nodal switchover	D
3.1.4.4.1.3.2.3	Nodal restoration	D
3.1.4.4.1.3.2.4	Data integrity requirements	D,T,-
3.1.4.4.1.3.3	Failure of interfacing systems	-
3.1.4.4.1.3.3.1	NADIN PSN failure	D
3.1.4.4.1.3.3.2	NWSTG failure	D
3.1.4.4.1.3.3.3	WMSCR internodal link failure	D
3.1.4.4.1.3.3.4	RWP failure	D
3.1.4.4.1.3.3.5	AWP failure	D
3.1.4.4.1.3.3.6	CNSP failure	D
3.1.4.4.1.3.3.7	ADAS failure	D
3.1.4.4.1.3.3.8	Message switch gateway failure	-
3.1.4.4.1.3.3.9	Carswell (KAWN) failure	D
3.1.4.4.1.3.3.10	Airline packet network user failure	D
3.1.4.4.1.3.3.11	Asynchronous subscriber failure	-
3.1.4.4.1.3.3.12	Leased Service A System failure	D
3.1.4.4.1.3.3.13	National Severe Storm Forecast Center (NSSFC) failure	D
3.1.4.4.1.3.3.14	WCP failure	D
3.1.4.4.1.3.3.15	MPS failure	D
3.1.4.4.1.3.3.16	TMP failure	D
3.1.4.4.1.4	System event logging function	I,D
3.1.4.4.1.4.1	Event number	D
3.1.4.4.1.4.2	Event date/time	D
3.1.4.4.1.4.3	Event priority	D,-
3.1.4.4.1.4.4	Event notice text	D
3.1.4.4.1.4.5	System event log printer	D
3.1.4.4.1.4.6	System event log display	D
3.1.4.4.1.4.7	Off-line journal of system event log	D
3.1.4.4.1.4.8	MPS event logging function	D
3.1.4.4.1.5	System statistics	I,A,D
3.1.4.4.1.5.1	System statistics for MPS	D,A

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.1.4.4.2	Operator control	-
3.1.4.4.2.1	Operator position characteristics	I
3.1.4.4.2.1.1	Video control terminal	D
3.1.4.4.2.1.1.1	On-line control	I
3.1.4.4.2.1.1.2	Command language syntax	I,D
3.1.4.4.2.1.1.3	Operator terminal security	D
3.1.4.4.2.1.1.4	Command recording	D
3.1.4.4.2.1.2	Printer operation	D
3.1.4.4.2.1.3	System event log printer	D
3.1.4.4.2.1.4	Operator alarm	D,T
3.1.4.4.2.2	Operator Control functions	I
3.1.4.4.2.2.1	Communications function	-
3.1.4.4.2.2.1.1	Communications interface control	I
3.1.4.4.2.2.1.1.1	Network configuration control	D
3.1.4.4.2.2.1.1.2	Circuit activation and deactivation	I,D
3.1.4.4.2.2.1.1.3	Network status display	D
3.1.4.4.2.2.1.1.4	Circuit event notification and alarm	D
3.1.4.4.2.2.1.1.5	Circuit testing	D
3.1.4.4.2.2.1.2	Communication storage control	-
3.1.4.4.2.2.1.2.1	Display communication storage status	D
3.1.4.4.2.2.1.2.2	Communications storage retrieval	D
3.1.4.4.2.2.1.2.3	Operator-controlled data deletion	D
3.1.4.4.2.2.1.2.4	Alternate destination activation/deactivation	D
3.1.4.4.2.2.2	Processing function	-
3.1.4.4.2.2.2.1	Processing control	-
3.1.4.4.2.2.2.1.1	Add element to the PIDB	D
3.1.4.4.2.2.2.1.2	Delete element from the PIDB	D
3.1.4.4.2.2.2.1.3	Modify product distribution	D
3.1.4.4.2.2.2.1.4	Modify product validation criteria	D
3.1.4.4.2.2.2.1.5	Modify product priority	D
3.1.4.4.2.2.2.1.6	Modify weather product retention information	D
3.1.4.4.2.2.2.1.7	Modify product triggered assembly information	D
3.1.4.4.2.2.2.1.8	Modify product processing information	D
3.1.4.4.2.2.2.1.9	Display product status	D
3.1.4.4.2.2.2.1.10	Modify routing by source	D
3.1.4.4.2.2.2.2	Product assembly control	D
3.1.4.4.2.2.2.2.1	Overall control of product assembly	-
3.1.4.4.2.2.2.2.2	Status display of product assembly	D
3.1.4.4.2.2.2.2.3	On-line update of PADB	D
3.1.4.4.2.2.2.2.3.1	Display PADB schedule	D

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.1.4.4.2.2.2.3.2	Addition and deletion of PADB schedule entries	D
3.1.4.4.2.2.2.3.3	Creation of temporary entries in the PADB schedule	D
3.1.4.4.2.2.2.3.4	Suppression of PADB schedule entries	D
3.1.4.4.2.2.2.3.5	Modify format definitions	D,I
3.1.4.4.2.2.2.4	Off-line backup and restore	D
3.1.4.4.2.2.3	Editing control	-
3.1.4.4.2.2.3.1	Initiate manual editing	D
3.1.4.4.2.2.3.2	Scan for further errors	D
3.1.4.4.2.2.3.3	Return product for processing	D
3.1.4.4.2.2.3.4	Terminate manual editing	D
3.1.4.4.2.2.3.5	Create a PIDB entry	D,I
3.1.4.4.2.2.3.6	Data entry	D
3.1.4.4.2.3	Static and dynamic data base control	-
3.1.4.4.2.3.1	Static data base control	-
3.1.4.4.2.3.1.1	Static data base control for product information	-
3.1.4.4.2.3.1.2	Static Information data base status	D
3.1.4.4.2.3.1.2.1	Addition of a reporting station	D
3.1.4.4.2.3.1.2.2	Deletion of reporting stations	D
3.1.4.4.2.3.1.2.3	Modification of reporting station information	D
3.1.4.4.2.3.1.2.4	Static Information data base status	D
3.1.4.4.2.3.2	Dynamic data base control	-
3.1.4.4.2.3.2.1	Overall dynamic data base status	D,-
3.1.4.4.2.3.2.2	Dynamic data base data manipulation	D
3.1.4.4.2.3.2.2.1	Display weather product status	D,-
3.1.4.4.2.3.2.2.2	Display weather and NOTAM report status	D
3.1.4.4.2.3.2.2.3	Display weather product text	D
3.1.4.4.2.3.2.2.4	Display weather and NOTAM report text	D
3.1.4.4.2.3.2.2.5	Modify products and reports	D
3.1.4.4.2.3.2.2.6	Deletion of products and reports	D
3.1.4.4.2.3.2.2.7	Modify default report retention period	D
3.1.4.4.2.2.3.3	Collective breakdown data base modification	D
3.1.4.4.2.2.3.4	Textual retrieval adaptation database maintenance	D
3.1.4.4.2.2.3.5	Journal control	-
3.1.4.4.2.2.3.5.1	Journal status display	D,A
3.1.4.4.2.2.3.5.2	Journal off-line transfer command	D
3.1.4.4.2.2.3.5.3	Execute journal utility	I,-,D

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.1.4.4.2.2.4	Control function	-
3.1.4.4.2.2.4.1	Overall system control	-
3.1.4.4.2.2.4.1.1	System startup/restart	D
3.1.4.4.2.2.4.1.1.1	Restart while in normal operating mode	D
3.1.4.4.2.2.4.1.1.2	Restart while in degraded operating mode	D
3.1.4.4.2.2.4.1.2	Hardware configuration control	I,D
3.1.4.4.2.2.4.1.3	Operational configuration control	D
3.1.4.4.2.2.4.1.4	Display overall system status	D
3.1.4.4.2.2.4.1.5	Major processing functions status display	D
3.1.4.4.2.2.4.1.6	Privilege data base maintenance	D
3.1.4.4.2.2.4.1.7	Printer function configuration	D
3.1.4.4.2.2.4.1.8	Data base maintenance control	D
3.1.4.4.2.2.4.1.9	Internodal utility control	D
3.1.4.4.2.2.4.2	System event log control	-
3.1.4.4.2.2.4.2.1	Display portion of event log on control terminal	D
3.1.4.4.2.2.4.2.2	Audible alarm response	D
3.1.4.4.3	Performance requirements	-
3.1.4.4.3.1	Internodal coordination requirements	T
3.1.4.4.3.2	Failure recovery	-
3.1.4.4.3.2.1	Component failure	T
3.2.4.4.3.2.2	Nodal transfer	D,T
3.1.4.4.3.3	Operator command functions	T
3.1.4.5	Development and testing function	-
3.1.4.5.1	Software development test bed	I,D
3.1.4.5.1.1	Unit testing	D
3.1.4.5.1.2	Nodal transfer	D
3.1.4.5.2	Network simulator	D
3.1.4.5.2.1	Interface simulation	D
3.1.4.5.2.2	Test data set entry and storage	I,D
3.1.4.5.2.3	Traffic capture and display	D
3.1.4.5.2.4	Network simulator configuration	I
3.1.5	WMSCR functional flow diagram	-
3.1.6	Configuration allocation	-
3.1.7	Interface requirements	-
3.1.7.1	External interfaces	-
3.1.7.1.1	External systems interface diagram	-
3.1.7.2	Internal interfaces	-
3.1.8	Government-furnished property list	-

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.2	System characteristics	-
3.2.1	Physical requirements	-
3.2.1.1	Weight limits	I
3.2.1.2	Dimensional limits	I
3.2.1.2.1	Accessibility	I
3.2.1.2.2	Access clearance	I
3.2.1.3	Durability	I
3.2.1.4	Power requirements	D
3.2.1.4.1	Power distribution	I,D
3.2.1.5	Electrical grounding/interfacing	-
3.2.1.5.1	Grounding and bonding	I
3.2.1.5.2	Grounding networks	I
3.2.1.5.2.1	AC ground	I,T
3.2.1.5.2.2	Chassis ground	I,T
3.2.1.5.2.3	Signal ground	T
3.2.1.5.2.4	Circuit ground	I
3.2.1.5.2.5	Return paths	I
3.2.1.5.2.6	Electrostatic discharge (ESD)	I
3.2.1.6	Wiring	I
3.2.1.7	Cooling	-
3.2.1.7.1	Internal temperature	T
3.2.1.7.2	Forced-air cooling	I
3.2.1.7.3	Airflow	I
3.2.1.8	Security	I
3.2.2	Environmental conditions	-
3.2.2.1	Natural environment	I
3.2.2.2	Induced environment	I,T
3.2.3	Materials, processes, and parts	I
3.2.3.1	Corrosion	I
3.2.3.2	Dissimilar metals	I
3.2.3.3	Hermetic sealing	I
3.2.3.4	Parts	I
3.2.4	Electromagnetic interference requirements	I,T
3.2.5	Workmanship	I
3.2.6	Interchangeability	I
3.2.7	Safety	I
3.2.8	Deployment requirements	-
3.2.8.1	Production system deployment sites	-
3.2.8.2	WMSCR production systems	-
3.2.9	System effectiveness models	I
3.2.10	Human performance/human engineering	I
3.2.11	Nameplates and nomenclature	I
3.2.11.1	Serial numbers	I

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.3	Processing resources	-
3.3.1	System elements	-
3.3.1.1	General requirements	-
3.3.1.1.1	Off-the-shelf	I
3.3.1.1.2	Redundant equipment	D,T
3.3.1.1.3	Growth requirements	D,A
3.3.1.2	Central processor	-
3.3.1.2.1	Processing speed	-
3.3.1.2.2	Main memory	I
3.3.1.2.3	Word size	-
3.3.1 2.4	Character set standard	I
3.3.1.2.5	Instruction set architecture	-
3.3.1.2.6	Interrupt capabilities	-
3.3.1.2.7	Direct Memory Access (DMA)	-
3.3.1.3	Secondary storage	I
3.3.1.4	Data channel requirements	-
3.3.1.5	Front-end communications processor	I,-
3.3.1.6	Off-line storage for journal entries	I
3.3.1.7	Video Display Terminals	I
3.3.1.8	Printers	I
3.3.1.8.1	High-speed line printer	D
3.3.1.8.2	Low-speed printer	I
3.3.2	System software requirements	I
3.3.2.1	System configuration	I,D
3.3.2.2	Task management	I
3.3.2.3	Memory management	I
3.3.2.4	Device management	I
3.3.2.5	File management	I
3.3.2.6	Time management	T
3.3.2.7	System control	I
3.3.2.7.1	Initiation/termination	D
3.3.2.7.2	Performance monitoring	D,-
3.3.2.8	Development software	I,-,D
3.3.2.8.1	Compilers/assemblers/link editors	I
3.3.2.8.2	Debugger	I
3.3.2.8.3	Program library maintenance system	I
3.3.2.9	Diagnostic software	I
3.3.3	Design and coding constraints	-
3.3.3.1	Software design requirements	I,-
3.3.3.1.1	Software design considerations	I,-
3.3.3.1.2	Design unit attributes	I,-
3.3.3.1.3	Design representation	I,-

Table 6. Qualification Cross-Reference Table (Cont'd)

Paragraph	Paragraph Name	Method
3.3.3.1.4	Special design tools and techniques	I,-
3.3.3.2	Software development	I
3.3.3.2.1	Unit attributes	I
3.3.3.2.2	Use of commercial and reusable software	I
3.4	Quality factors	-
3.4.1	Reliability	A
3.4.1.1	Design reliability	-
3.4.1.2	Design policy	-
3.4.1.2.1	Single-point failures	I
3.4.1.2.2	Propagation of primary failures	T
3.4.1.2.3	Backup equipment	I,T
3.4.1.2.4	Functional independence	I
3.4.1.2.5	Controlled degradation	T
3.4.2	Maintainability	A
3.4.2.1	Maintainability policy	I,A
3.4.2.2	Design constraints	-
3.4.2.2.1	Service and access	I
3.4.2.2.2	Test points	I
3.4.2.3	Modularity	I
3.4.2.4	Monitoring requirements	D,T
3.4.3	Availability	-,A
3.4.4	Transportability	I
3.4.5	Additional quality factors	I
3.5	Logistics	-
3.5.1	Maintenance	-
3.5.1.1	Maintenance concept	-
3.5.1.1.1	Site (NAWPF)-level maintenance	-
3.5.1.1.2	Sector Repair Center (SRC)-level maintenance	-
3.5.1.1.3	Depot-level maintenance	-
3.5.1.1.4	LRU definition	-
3.5.1.2	Support and test equipment (S&TE)	-
3.5.1.2.1	System-level test equipment	-
3.5.2	Supply	I
3.5.3	Support facilities	I
3.5.4	Personnel	-
3.5.4.1	Maintenance personnel	-
3.5.5	Training	I

Table 6. Qualification Cross-Reference Table (Concl)

Paragraph	Paragraph Name	Method
3.6	Precedence	-
3.6.1	Intrinsic system capabilities	-
3.6.2	Inter-system independence	-
3.6.3	Performance standards	-
3.6.4	Design goals	-
3.7	Configuration management requirements	I

5.0 PREPARATION FOR DELIVERY

5.1 General.

5.1.1 Level of preservation protection. The level of preservation shall afford adequate protection against corrosion, deterioration, and physical damage during shipment from the supply source to the first receiving activity where the item may be subject to immediate use or storage.

5.1.2 Level of packing protection. The level of packing shall afford protection against damage during direct domestic shipment from the supply source to the first receiving activity for immediate use. This level, in general, will conform to applicable carrier rules and regulations.

5.2 Packing. Equipment packed for shipment shall be packed so that it will not be damaged in transit.

5.2.1 Packing small components and material. Small individual items or components shall be packed and marked both internally and on the exterior surface of the containers. Packing of this material shall be in accordance with MIL-E-17555, Level C.

5.2.2 Packing for spares and storage. All spare parts shall be marked, packaged, and packed for delivery and/or storage in accordance with the requirements of MIL-E-17555, using Level A preservation and packaging and Level C packing.

5.2.3 Barrier material. A sealed, water-vaporproof bag or equivalent shall provide a protective wrapping around all WMSCR components and equipment.

5.2.4 Items included in packing. The following items shall be included, as defined in the Contract:

a. Instruction books.

b. Spare parts.

c. Cables and accessory items furnished with the equipment.

d. Modification records.

e. Any parts or assemblies removed for reasons other than an Agency-wide modification. This would include any item removed to satisfy conditions unique to one facility, but that may be needed if the equipment should be installed at another facility.

f. Any modification kits on hand, but not installed in the equipment to be transferred.

g. Other necessary records (e.g., repair log book, etc.).

5.2.5 Marking. Each shipment shall be marked to allow identification of contents without unpacking. Marking requirements, including materials, methods, and sizes of markings, shall be in accordance with MIL-STD-129.

5.2.6 Packing list. Each shipment shall contain a packing list showing in detail a complete description and quantities of each item in the shipment. The packing list shall contain the following minimum information:

a) Unit name(s).

b) Part number(s).

c) Serial number(s).

d) Manufacturer.

e) Shipping number.

f) Date packed.

g) Originating location.

h) Destination.

5.3 Shipment. Shipment of all material and equipment required for WMSCR installation at any site listed in the contract schedule shall be the responsibility of the contractor, including off-loading and emplacement of equipment. Shipment of WMSCR equipment from the contractor's plant to a specific site within the continental limits of the United States shall be by a carrier suitable for shipment of electronic equipment.

6.0 NOTES

Symbols are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

6.1 Acronyms.

AC	Alternating Current
ADAS	AWOS Data Acquisition System
ADCCP	American National Standard for Advanced Data Communication Control Procedure
ADU	Application Data Unit
AFOS	Automation of Field Operations and Services
AFTN	Aeronautical Fixed Telecommunications Network
AGL	Above Ground Level
AIRMET	Aviation Meteorological Flight Advisory
ANSI	American National Standards Institute
APAD	Asynchronous Protocol Assembler and Disessembler
ARTCC	Air Route Traffic Control Center
ASCII	American Standard Code for Information Interchange
ATA	Air Transport Association
ATC	Air Traffic Control
ATE	Automatic Test Equipment
AUTOB	Automatic Observation
AWOS	Automated Weather Observing System
AWP	Aviation Weather Processor
BA	Balanced Asynchronous
BIT	Built-In Test
BITE	Built-In Test Equipment
bps	Bits-per-second
CCITT	Consultative Committee on International Telegraphy and Telephony

CDR	Critical Design Review
CI	Configuration Item
CNSP	Consolidated NOTAM System Processor
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
CRF	Central Repair Facility
CSCI	Computer Software Configuration Item
CTS	Coded Time Source
CWP	Central Weather Processor
CWSU	Center Weather Service Unit
DC	Direct Current
DCE	Data Circuit-Terminating Equipment
DLP	See WCP
DMA	Direct Memory Access
DTE	Data Terminal Equipment
EBCDIC	Extended Binary Coded Decimal Interchange Code
EIA	Electronic Industries Association
ESD	Electrostatic Discharge
FA	Forecast, Area
FAA	Federal Aviation Administration
FAT	Factory Acceptance Test
FCM	Federal Coordinator for Meteorology
FIFO	First In First Out
FO	Forecast, Operational
FP	Forecast, Public
FSAS	Flight Service Automation System
FSDPS	Flight Service Data Processing System

FSS	Flight Service Station
FT	Forecast, Terminal
GFP	Government-Furnished Property
GMT	Greenwich Mean Time
ICAO	International Civil Aviation Organization
IEEE	Institute for Electronic and Electronic Engineering
IRD	Interface Requirements Document
ISO	International Standards Organization
KAWN	Carswell Airforce Base
KBPS	Kilobytes Per Second
LAPB	Link Access Procedure Balanced
LPM	Lines Per Minute
LRU	Line Replaceable Unit
METAR	Meteorological Airport Report
MID	Message Identification
MKC	Kansas City, MO
MMS	Maintenance Management System
MPS	Maintenance Processor Subsystem
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
MWP	Meteorologists Weather Processor
NADIN	National Airspace Data Interchange Network
NAS	National Airspace System
NAWPF	National Aviation Weather Processing Facility
NCDB	Network Configuration Data Base
NEC	National Electric Code

NFPA	National Fire Prevention Association
NOTAM	Notice to Airmen
NSSFC	National Severe Storm Forecast Center
NWID	NWSTG/WMSCR Interface Device
NWSTG	National Weather Service Telecommunication Gateway
OEM	Original Equipment Manufacturer
OSHA	Occupational Safety and Health Administration
OSI	Open Systems Interconnection
OT&E	Operational Test and Evaluation
PADB	Product Assembly Data Base
PC/PAD	Protocol Converter/Packet Assembler Disassembler
PCS	Power Conditioning System
PIDB	Product Information Data Base
PIREP	Pilot Report
PM	Preventive Maintenance
PSN	Packet Switch Network
PVC	Permanent Virtual Circuit
QA	Quality Assurance
QWERTY	See Glossary
RMA	Reliability, Maintainability, Availability
RMMS	Remote Maintenance Monitoring System
RS	Record Special Observation
RWP	Real Time Weather Processor
SA	Surface Aviation Weather Observation

SAS	Service "A" System
SAT	Site Acceptance Test
SER	System Effectiveness Review
SIGMET	Significant Meteorological Flight Advisory
SOW	Statement of Work
SP	Special Observation
SPDU	Session Protocol Data Unit
SIDB	Station Information Data Base
SIT	System Integration and Test
SPC	Synchronous Protocol Converter
SRC	Sector Repair Center
SYNS	Transcribed Weather Broadcast Synopsis
TAF	Terminal Aerodrome Forecast
TBD	To Be Determined
TBS	To Be Specified
TWEB	Transcribed Weather Broadcast
TMP	Traffic Management Processor
TPDU	Transport Protocol Data Units
TRR	Test Readiness Review
UCT	Universal Coordinated Time
UPI	Universal Product Identifier
URI	Universal Report Identifier
USP	Urgent Special Observation
UT	Unit Test
VDU	Video Display Unit

VRTM	Verification Requirements Traceability Matrix
WA	Warning, Aviation
WCP	Weather Communications Processor/Data Link Processor
WMO	World Meteorological Organization
WSFP	Weather Service Field Office
WMSC	Weather Message Switching Center
WMSCR	Weather Message Switching Center Replacement
WS	Warning, Significant Weather
WSFO	Weather Service Field Office
WST	Warning, Convective Significant Weather
WW	Warning, Severe Weather
Z	Refer to GMT

6.2 Glossary.

Adaptation data base - An adaptation data base or table allows generalized software to perform specific functions based on information in the database. Adaptation data bases promote "table driven" or "modular-tabular" software. Such data bases allow processing functions to change by alteration of data in the data base. WMSCR has several such data bases such as the PIDB, NCDB, PADB, SIDB and others.

Advanced Data Communications Communications Protocol (ADCCP). ADCCP is also called ANSI X3.66. It is a link-level, bit-oriented synchronous protocol widely used for U.S. Government and military communications systems. ADCCP has a wide variety of options that permit it to support users with different requirements. The Balanced Asynchronous (BA) option renders ADCCP nearly identical to X.25 LAPB. WMSCR uses both the balanced and unbalanced options.

Aeronautical Fixed Telecommunications Network (AFTN). The AFTN is an international civil aviation store-and-forward message switching system. It is fully compliant with ICAO telecommunications procedures. It is used principally for the exchange of flight movement data and weather information.

Airmens Meterological Information (AIRMET) - A warning message reporting weather phenomena considered dangerous to smaller aircraft.

Application Data Unit (ADU). The ADU is the data unit associated with the highest layer of the ISO/OSI model. It consists of the presentation layer (or next lower layer) and the application header.

Application software - Application software is specific to the functions performed by a particular system. It does not include "system" software.

Asynchronous user - Asynchronous users are a group of WMSCR subscribers connected via a protocol converter located at each of the NADIN Packet Network nodes. These users consist of airlines and commercial subscribers of the "604" service. Each asynchronous subscriber receives data in 7-bit ASCII code with parity in asynchronous format (one start bit and one stop bit). The asynchronous protocol is output-only with no error-checking protocol.

Automatic - A term that applies to an activity or function that is performed by the WMSCR without operator intervention.

Automatic Weather Observing System (AWOS) - A system, located at selected airports, composed of meteorological sensors, processor, and communications outputs. Meteorological parameters such as wind speed, wind direction, temperature, dew-point temperature, pressure, precipitation, visibility, and cloud height are measured, and then processed through averaging and analyzing routines. The processed data is then sent to the CWP via the AWOS Data Acquisition System and provides surface observations on a minute-by-minute basis from airports where AWOSs are located.

Automation of Field Operations and Services (AFOS) - A currently existing NWS computer graphic/alphanumeric weather data display system.

Aviation Weather Processor (AWP) - A computer system intended to house, maintain, and process a national weather data base for use by the flight service stations. The system will receive weather data from the Weather Message Switching Center Replacements (WMSCRs) at Salt Lake City and Atlanta. It will edit, expand, process, and store these weather data and subsequently distribute these data to the Flight Service Data Processing Systems (FSDPSs). Weather update information will be received from the FSDPS and sent to the WMSCR for dissemination to other WMSCR users. In addition to weather processing, the AWP will receive, store, and distribute NOTAM messages.

AWOS Data Acquisition System (ADAS). Each ADAS will connect to a maximum of 137 Automated Weather Observing Systems (AWOS). The ADAS will concentrate and format the data and will interface to external users, including WMSCR, via the NADIN packet switch. There will be up to 23 ADASs connected to WMSCR.

Backup state - A WMSCR node enters the backup state when critical hardware or software fail within that node and the node attempts to continue operation on backup equipment (if any).

Balanced Asynchronous Option (BA option). This is an option of the ADCCP protocol that renders it nearly similar to the X.25 LAPB link layer protocol.

Bandwidth - Bandwidth is a measure of the capacity of a communication link (usually the higher speed links) as measured in bits per second.

Breakdown - The process by which the reports in a collective are isolated, identified, and stored on the report data base. See the definitions for Product, Report, and Collective.

Breakdown collective - A collective that is designated to be broken down into individual reports. The integrity of the original product (collective) is not destroyed, and the data can be retrieved both by the identification of the original product and individually by the identification of each report. See Non-breakdown Collective.

Carswell - Carswell Air Force Base, also referred to by its ICAO identification, KAWN. Carswell is the source of most military field observations, forecasts, and pilot reports.

Center Weather Service Unit (CWSU) - The meteorological unit stationed at each ARTCC and consisting of NWS personnel and equipment organized for the purpose of detecting, displaying, and disseminating weather information in a timely manner.

Central Processing Unit (CPU). The CPU is the principal control and computational element of a computer system. It consists typically of a program control unit, arithmetic and logical operation unit, and data channels for exchange of data with peripherals.

Circuit - A communications pathway between two systems or subscribers. A circuit can be a physical pathway consisting of copper wire, microwave equipment, and the like. Or it can be a conceptual entity representing the pathway over a communication utility such as a packet switch network.

Collective - A product that consists of a collection of reports of the same generic type.

Configuration - The arrangement of the components of a system.

Data element - Terminology used to describe products and reports.

Data request format - Refer to Appendix IV for a description of the allowable formats for data requests.

Dedicated link - A connection between two systems that is dedicated to that purpose. This is as opposed to a link that uses a communications utility such as the NADIN packet switch network.

Degraded operation mode - A WMSCR node operates in a degraded mode whenever another node has entered the failed state.

Direct Memory Access (DMA). A hardware design feature whereby data can be exchanged between main memory and communications peripherals without the involvement of the CPU.

Dual-function state - A WMSCR node is in the dual-function state when it performs both the normal functions of the node plus the functions normally performed by the other WMSCR node which is in the failed state.

Dynamic data base - Data bases containing the actual weather and/or NOTAM data as opposed to any static information utilized in the control and manipulation of that data. WMSCRs conceptual design suggests the use of a dynamic product data base and a dynamic report data base(s).

End-to-end - End-to-end refers to the full extent of a connection between two systems. This connection may transit one or more communications or processing systems. End-to-end data integrity, for example, refers to the ability to ensure the transmission of data between two systems not necessarily directly connected.

Failed state - A WMSCR node is in the failed state when its primary equipment and its redundant equipment (if any) at the node has failed.

FCM-S2 Format - Federal Coordinator for meteorologist services and supporting research, standard formats for weather data exchange among automated weather information systems. WMSCR will handle vector graphics using FCM-S2 formats.

Flight Service Automation System (FSAS) - The planned upgrade of the flight service system that involves replacing approximately 300 FSSs with approximately 60 FSASs. These FSASs will be provided with weather information via 21 FSDPSs located in the Air Route Traffic Control Centers (ARTCCs) and 2 AWPs.

Flight Service Data Processing System (FSDPS). The FSDPS is part of the FSAS serving the larger flight service stations. The Model 1 FSDPS will communicate with WMSCR via the Service A Gateway. The Model 2 FSDPS will have no direct contact with WMSCR. The FSDPS will automate the flight service station operation. The FSDPS will have the data processing capability to perform both Flight Plan Processing and Dissemination and weather and NOTAM processing and distribution.

Format - A predetermined arrangement of characters, field, lines, and punctuation. A part of the PADB used to define the contents and organization of a product being assembled.

Frame - A link layer data element. Frames are exchanged on X.25 and ADCCP interfaces. Frames are delimited by the framing character, hexi-decimal 7E.

Full duplex - A characteristic of communications circuits allowing them to exchange data simultaneously in both directions.

Header - The initial part of a product which contains fields that define the contents. Both WMO- and ICAO-formatted messages have headers.

Help Function - On-line assistance,to user-errors and inquiries, integrated in a software product and designed for multiple user-competance levels.

Interface - A connection point that links system elements with defined characteristics. Interface is used most often in this document to denote the physical circuits between WMSCR and other systems.

International Civil Aviation Organization (ICAO) - An international organization of the civil aviation bodies headquartered in Montreal, Canada. Pronounced "eye kay oh". ICAO has the responsibility of explaining international rules/regulations to the public pertaining to aircraft/safety restrictions.

International Standards Organization-Open System Interconnection Model (ISO/OSI Model) - The ISO-OSI model is a seven-layer organizational mechanism for defining the procedures and formats for data exchange between two interconnecting systems.

Journal - A list of data and events that forms an historical record of WMSCR system activity and that will permit an operator-trace of all system activities. The journal migrates from on-line storage to off-line media on a controlled cycle.

Link - A pathway for the exchange of data between two systems. See Circuit.

Link Access Protocol Balanced (LAPB). LAPB is the link protocol defined in the X.25 protocol. It is a bit-oriented, synchronous protocol between peer systems.

System Event Log - The mechanism used by WMSCR for unsolicited computer-to-operator communication and operator notification of significant system events. The system event log is printed on a hard-copy printer dedicated to that purpose. It is also available for display on any command VDU.

Line Replaceable Unit (LRU) - The smallest hardware element of the system that can be exchanged without repair. An LRU is a repairable unit consisting of a combination of components, parts, assemblies, subassemblies, etc., which, when removed and replaced, will restore the larger entity within which it operates to an operational configuration. It excludes items falling under the definition for a repair/piece part.

Maintenance Processor Subsystem (MPS) - A system that is part of the NAS with responsibility for determining the status of each system component. WMSCR sends periodic reports of system status to the MPS. Unlike most remote systems, however, the MPS exhibits no control over WMSCR.

Message - A unit of text transmitted over a communications medium. A message is generally synonymous with a product except in cases such as data requests and administrative messages.

Message Identifier (MID) field - This 2-byte field is found at the beginning of every ADCCP frame. It defines the bounds of the application data unit.

Message switch user - A WMSCR subscriber connected to the NADIN message switch.

Monitor - To supervise and control the operation of several WMSCR activities to ensure that the system and time are used efficiently.

More-data-bit procedure - A mechanism in both the X.25 and ADCCP link-level protocols that is used to define a complete packet sequence forming a transport data unit. The M-bit (more data bit) indicates that the subsequent packet is part of the same TDU. See MID field.

NADIN Message Switch - The NADIN-1A message switch and the associated network is an ICAO-type message switch exchanging alphanumeric data between elements of the NAS. It consists of two main centers (Atlanta and Salt Lake City) connected to remote concentrators located at each of the ARTCCs.

NADIN Packet Network - The NADIN PSN consists of an X.25 packet network with packet switching hardware located at each of the ARTCCs.

NADIN Packet Switch - The nodal component of the NADIN PSN consisting of computerized systems at each ARTCC/ACF and or NAWPF.

NAS Plan (April 1983) - An FAA proposal that outlines a number of modernization programs designed to improve the collection, analysis, and dissemination of weather information with the objective of enhancing the safety and efficiency of the NAS. One of these programs is the WMSCR program.

National Airspace Data Interchange Network (NADIN) - Facilities used for the exchange of data between systems forming the NAS. It consists of the NADIN Message Switch network designated NADIN IA, and the NADIN Packet network, designated NADIN 2.

National Airspace System (NAS) - The common network of U.S. airspace composed of air navigation facilities, equipment and services, airports or landing areas aeronautical charts, information and services, rules, regulations and procedures, technical information, and manpower and material.

National Communications Center (NATCOM). The NATCOM facility is located in Kansas City, MO. It is the site of the WMSC system, the predecessor system to WMSCR.

National Severe Storms Forecast Center (NSSFC) - The main responsibility of the NWS national center located in Kansas City is issuing forecasts of expected severe local convective storms and tornadoes and convective SIGMETs over the contiguous 48 states. In addition, the NSSFC issues forecasts for winter storms.

National Weather Service Telecommunications Gateway (NWSTG) - The facility in Washington, D.C., responsible for preparing forecasts and charts of observed and forecast weather from worldwide weather reports (formerly called NMC).

Network Configuration Data Base (NCDB) - The NCDB is an adaptation data base containing all information about the WMSCR communications environment. The information in the NCDB controls the operation of the communications function.

Network Simulator - In the context of the WMSCR specification, the network simulator is a software product which will duplicate the operation and behavior of the WMSCR communications network and WMSCR subscribers. It will permit testing of the WMSCR system , via data introduction to that system, prior to the availability of actual communication interfaces.

Node - A WMSCR node consists of hardware equipment and software situated at the Atlanta or Salt Lake City NAWPF installations.

Non-breakdown collective - A product containing reports for which the PIDB indicates it is not to have the reports stored individually in the station data base.

Normal operation mode - This mode exists when a node is performing its assigned functions on primary or redundant equipment.

Notice to Airmen (NOTAM).- A notice containing information (not known sufficiently in advance to publicize by other procedures) about any hazard in the National Airspace System for which timely knowledge is essential for flight operations.

Off the-shelf - pertaining to items produced and placed in stock by a contractor, or stocked by a distributor, before receiving orders or contracts for its sale. The item may be commercial or produced to military or federal specifications or description.

On-line - A term that implies interactive communication between a computer system and a system user.

Operating system - Computer software that interfaces between application programs and the computer hardware. The operating system performs services for the application programs while controlling the hardware. The operating system is often referred to as system software and is generally provided by the hardware manufacturer.

Packet - A short block of data prefixed with addressing and other control information that carries data through a packet switching network.

Packet Assembler Disassembler (PAD) - A device on a packet network that is used to convert between the packet format used on the network to some external format that is not packet-oriented.

Packet Switch Network (PSN) - A system consisting of communication circuits and nodal computing equipment used to establish connections between subscribers for the exchange of data packets.

Partition - A term used in this specification to denote a section of communications data storage associated with a specific destination. A partition has all the attributes of a FIFO queue with eight levels of priority.

Peer-to-peer protocol - The procedures and formats that are used for the exchange of data between the same layers of connected systems.

Permanent Virtual Circuit (PVC) - A PVC is a predetermined pathway through a packet network between two subscribers that is automatically established by the network. A PVC does not require the execution of call setup procedures.

Power Conditioning System (PCS).- A system used to ensure stable electrical power to attached equipment. Such a system typically eliminates power surges and sags and, if equipped with battery or generator equipment, can provide power even when a total power failure occurs.

Primary state - The WMSCR state when the node is performing its assigned functions on the primary equipment and redundant equipment is available.

Procedure - A predefined set of actions.

Product - A unit of data identified by a Universal Product Identifier (UPI) and associated with an entry in the PIDB. Within WMSCR two principal product types are used. These include alphanumeric products identified by a WMO header and graphics products identified by the FCM-S2 identifier.

Product assembly - The process by which WMSCR assembles a new product from data stored in the dynamic data base(s). This process occurs on a predefined schedule determined by the PADB schedule or upon the receipt of a triggering product. PADB formats are used to determine which data are to be placed in the new product.

Product Assembly Data Base (PADB) - An adaptation data base that is used to control the operation of the product assembly function. It consists of two parts: The PADB schedule and PADB formats.

Product Assembly Data Base formats - These formats are used to define the desired contents of a product to be assembled by WMSCR. These formats are text files that contain instructions about the data to be placed in the created product. They are created by the operator on the command terminals and are a coded representation of the product to be created.

Product Assembly Data Base schedule - The Product Assembly Data Base schedule defines the times when new products are to be assembled from data in the weather and NOTAM dynamic data base(s). This schedule covers 24 hours and each element refers to one PADB format.

Product Information Data Base (PIDB) - The PIDB is an adaptation data base containing information about each product handled by WMSCR. The PIDB contains information used to control the major functions of product processing function including product identification, validation, distribution, and deletion. Each element in the PIDB is identified by the 11-byte key portion of the UPI.

Product priority - Each product defined in the PIDB is assigned a priority number with a range of 1 (lowest) to 8 (highest). This priority determines the order in which competing products are given system resources and the order in which they are transmitted on output circuits.

Program - A stored set of computer instructions used to perform a specific function.

Program Design Language (PDL) - A representation of program structure and functionality.

Protocol - A predefined set of procedures and formats to accomplish a given task. The term protocol is most often used to describe communication procedures.

Protocol Converter (PC) - This is a component of the packet network used to convert between protocols used by external subscribers and the X.25 packet protocol used by the packet network.

Purge - In the WMSCR system this term is used to describe the deletion of products or reports from the dynamic data base(s). Products and reports are deleted as they get older and become obsolete. The purge time for each product is a parameter in the PIDB. The purge time for reports is stored in the SIDB. Data may be purged from a queue based on the queue retention time.

Queue - A queue is an ordered list of data elements. In WMSCR a queue structure is defined as a requirement in order to exchange data between system elements operating at inherently different rates (e.g., circuits and product processing). The WMSCR queuing mechanism dequeues in FIFO order within priority level(s).

Queue retention limit - Each WMSCR queue has an associated retention limit that represents the maximum time undequeued data elements will be retained. After the limit has expired for each element the element is dequeued.

QWERTY - This is the name for the standard typewriter keyboard layout.

RC - One of the formats for data requests supported by WMSC as well as WMSCR. The RC request requests a product identified by its WMO identification.

Recovery state - This is the state of a failed WMSCR when it is restoring its data base to an operable condition but the node is still not performing its assigned functions.

Recovery support state - This is the state of the surviving node that corresponds to the recovery state at a failed node. In this state the surviving node is performing the functions of both nodes as well as providing the data for the recovery of the failed node's data base(s).

Report - A unit of data associated with a particular reporting or observing station. A report is usually an observation or a forecast. Each report has a unique identification called the URI, which is a combination of the reporting station name, date-time, and other information. Each report has an associated entry in the SIDB. Reports are often received as parts of products. Separating a report from its product is a process called collective breakdown. A report is stored in a report data base after collective breakdown occurs.

Response time - The time between receipt of a stimulus and the activity which results from that stimulus.

RL - One of the data request formats supported by the WMSC and also supported by WMSCR. The RL requests data that is predefined in a numbered list. Such lists contain one or more RC and RQ data requests.

RQ - One of the data request formats supported by the WMSC and also supported by the WMSCR. The RQ requests from one to seven reports identified by reporting station and type.

SA format - A format used to code surface aviation (SA) weather observations for domestic reporting stations. The format used for international stations (METAR) is different.

Service A System (SAS) - The SAS is a network and associated terminal equipment used to distribute data to flight service stations. It is sometimes called "leased Service A". It consists of Western Union GS-200 microcomputers and a cluster of terminals in each flight service station attached to a 2400-multipoint communication link terminated at the WMSCR. The SAS will be enhanced prior to the inauguration of WMSCR to support X.25 procedures.

Session - The fourth layer of the ISO model. The session layer performs services to the higher (presentation) layer relating to the transfer of large units of data.

Significant Meterological Information (SIGMET) - A warning message reporting significant weather, usually icing, turbulence, wind shear, thunderstorms, tornadoes, etc.

Station Information Data Base (SIDB) - The Station Information Data Base is an adaptation data base containing information about observing and reporting stations. It is defined as a static data base. It also contains linkages to each report on the dynamic report data base(s) for each station.

Static data base.- The static data base contains those adaptation data base(s) which contain information about products and reporting stations and detailed system control parameters.

Static text - Text that is found in PADB format definitions. Such text is duplicated exactly in assembled products.

Station - A physical location where, or about which, weather observations and/or forecasts are made. A station may be an airport, a ship, a buoy, etc.

Switched state - A WMSCR node enters this state (after a failure) when all nodal functions are being performed by the other node.

Synoptic - Synoptic means "at a given time". Synoptic weather observations are taken at particular periodic times. The name is usually applied to WMO-formatted observations from surface stations.

System purge time - The time a product or report is deleted from the system. See Purge time.

System software - Software provided with the specific computer hardware which performs support functions for the application. System software consists of an operating system, compilers and other development tools, data base management systems, and various utility programs. See Operating system.

Terminal forecasts - A meteorological forecast for conditions at an airport, usually with a validity period of 24 hours.

Terminal message format - A free-form textual message format supported by the MPS and used by WMSCR to send system status reports.

Test bed - A feature of the WMSCR that permits the development of all WMSCR application software and the testing of software from individual modules up to the entire system.

Text - That part of a message following and exclusive of the header. Any displayable data.

Transport Protocol Data Unit (TPDU) - A unit of data exchanged at the transport layer in the ISO/OSI model.

Universal Product Identifier (UPI) - An identification format into which the WMSCR will convert all incoming product identification methods.

Universal Report Identifier (URI) - An identification format into which the WMSCR will convert all incoming report identification methods.

User - Refers to a subscriber of the WMSCR system.

Variables - Elements found in the PADB format. Variables are used to represent data that will change from product to product or time to time; for example, the time of day. When a variable appears in a PADB format, product assembly will substitute the current value of the variable.

Visual Display Unit (VDU) - A terminal with keyboard that is used as an operator control position in the WMSCR system.

Weather Message Switching Center Replacement (WMSCR) - Refer to Section 1 for an introduction to WMSCR.

Weather Service Field Office - The ten WSFOs are NWS facilities serving specific regional areas. The ten are Boston (BOS), Chicago (CHI), Anchorage (ANC), Dallas (DFW), Honolulu (HNL), Fairbanks (FAI), Juneau (JNU), Miami (MIA), San Francisco (SFO), and Salt Lake City (SLC).

WMO format - A format for the exchange of alphanumeric information. Refer to Appendix V for details of the format.

WMO transmission envelope - The WMO transmission envelope consists of a leading SOM (hexidecimal 01) at the start of the message and a trailing ETX (hexidecimal 04) at the end of the message. This data is not stored on the data base.

World Meteorological Organization (WMO) - An international agency under the United Nations, headquartered in Geneva, Switzerland, whose objective is to promote human benefit and economic growth through the coordination of meteorological programs, standardization of meteorological procedures and communications, exchange of data and techniques, and expansion of meteorological capabilities, particularly in developing countries.

X.25 - A standard defining procedures in the lower three layers of the ISO/OSI model. These standards are used by the NADIN packet network.

604 - Circuit "604". The informal terminology used to describe the WMSC commercial weather data broadcast service which will also be supported by the WMSCR. This service operates at 1200 bps asynchronous with no error-checking protocol. This service has several thousand commercial subscribers.

9020 - En Route NAS, Stage A, Air Traffic Control computer. The main FAA computer system used to control the flow of air traffic and flight plans. The 9020 system receives weather data from WMSCR via the NADIN 1A message switch.

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APPENDIX I

10.

10.1 System Traffic Throughput Test Data Set

10.2 Purpose. The Weather Message Switching Center Replacement will require a system traffic throughput baseline test data set against which the performance of the system components can be measured for operational efficiency. The purpose of this appendix is to define the minimum traffic magnitudes and respective interfaces required to verify the performance of the developmental and operational WMSCR.

10.3 Test methodology. The test methodology to be employed mandates the processing of a body of work within a predetermined period of time thus permitting validation, via statistical analysis, of the systems functional performance. This will require a network simulator that will logically simulate all WMSCR external interfaces and create ,for distribution, all traffic vectors defined in this document. All input traffic generated and transmitted by the network simulator, in lieu of the actual system interfaces, shall be received by the WMSCR. All output traffic transmitted by WMSCR shall be received and stored by the network simulator. The baseline test data set magnitudes defined in this appendix shall cover one hour of operation of a WMSCR node. The system traffic throughput test data set is sized to represent a present-day peak system hour with a 100% growth-margin incorporated. WMSCR shall be fully functional in operation during the execution of this traffic throughput test data set. The test data set data content is not necessarily intended to be realistic, except where noted, but rather only to simulate the load on the system. It is expected that WMSCR shall maintain statistical data with respect to its overall performance. On-line and off-line evidence of the meeting of performance criteria, as stated throughout the WMSCR specification, must be provided as part of the testing process.

The Weather Message Switching Center Replacement and the network simulator shall maintain statistics to validate the WMSCR's operational efficiency as defined in the WMSCR Specification and referenced specifically in this appendix.

10.4 Test operational requirements. The Weather Message Switching Center Replacement shall require the following operational data configuration. The proposed network simulator shall require, as a minimum, the following data configuration and functional attributes. Although the test data set only covers one hour of operation, it is expected that WMSCR shall be able to continuously repeat the test without degradation of performance.

10.4.1 WMSCR operational data configuration. The WMSCR shall require the contents of the adaptation database(s) to be defined prior to utilization.The contents of WMSCR's NCDB,PIDB,PADB, and SIDB shall determine how the data introduced by the network simulator shall be processed.

10.4.1.1 NCDB Data configuration. The selection of specific parameters to be included in the NCDB for each circuit shall be entered into the database as defined in 3.1.4.1.1 of the WMSCR specification. Entries shall be derived from the WMSCR operational environment. The external direct interfaces documented in Table 1 shall be supported. The external indirect interfaces documented in Table 2 shall be supported.

10.4.1.2 PIDB data configuration. The selection of specific parameters to be included in the PIDB shall be in accordance with section 3.1.4.2.1 of the system specification. Entries shall be derived from the WMSCR operational environment.

10.4.1.3 PADB data configuration. The selection of specific parameters to be included in the PADB shall be in accordance with section 3.1.4.2.5.3 of the system specification. Entries shall be derived from the WMSCR operational environment.

10.4.1.4 SIDB data configuration. The selection of specific parameters to be included in the SIDB shall be in accordance with section 3.1.4.3.1.1.1.2 of the system specification. Entries shall be derived from the WMSCR operational environment.

10.4.2 Data traffic simulator functional attributes. The network simulator shall have the ability to simulate all interfaces of the Weather Message Switching Center Replacement. The network simulator shall generate data traffic patterns under a controlled sequence which includes duplication of data. The network simulator shall maintain statistics sufficient to analyze the operational performance of the Weather Message Switching Center Replacement.

10.4.2.1 Simulation of direct physical interfaces. The network simulator shall have the ability to simulate the operation of the NADIN PSN, the remote WMSCR node, NWSTG, and AWP interfaces.

Table 1 Test Data Set External Direct Interfaces

Interface	Data Types	WMSCR Specification IRD
National Weather Service Telecommunication Gateway	A/N	NAS-IR-90022507
AWP	A/N	NAS-IR-25042507

Table 2 Test Data Set External Indirect Interfaces Via NADIN PSN

Interface	Data Type	WMSCR Specification IRD
RWP	A/N, Graphics	NAS-IR-25072511
MWP	A/N, Graphics	NAS-IR-94022507
NSSFC	A/N	NAS-IR-94022507
KAWN	A/N	NAS-IR-94022507
ASYN. PAD	A/N	NAS-IR-94032507
Service A System	A/N	NAS-IR-94022507
ADAS	A/N	NAS-IR-25082507
WCP	A/N	NAS-IR-25072503
CNSP	A/N	NAS-IR-25072505
FSDPS	A/N	NAS-IR-25072505
ATA	A/N	NAS-IR-94032507
9020	A/N	NAS-IR-94012507
AFTN	A/N	NAS-IR-94012507
TMP	A/N	NAS-IR-25072401

10.4.2.2 Simulation of indirect physical interfaces via NADIN PSN. The network simulator shall have the ability to simulate the operation of all network connections supported by WMSCR which include RWP, MWP, WCP, NSSFC, KAWN, MPS, ATA, Asynchronous Users, FSDPS I, Leased Service A, ADAS, 9020/Host, AFTN, and CNSP.

10.4.2.3 Data traffic generation. The network simulator shall have the ability to create and transmit test data to the WMSCR which includes incoming weather product data and requests, weather and NOTAM report data and requests, breakdown collectives, and controlled duplicates of weather data.

10.4.2.4 Data traffic simulator statistics. The network simulator shall have the ability to maintain operational statistics, to validate automatic system operation, as defined in section 3.1.4.4.1.5 of the WMSCR specification. The network simulator shall have the ability to maintain operational statistics, to validate manually initiated operations,as defined in section 3.1.4.4.3 of the WMSCR Specification. The system shall have the capability to interactively display system statistics. The network simulator shall have the ability to receive transmissions from WMSCR on any simulated interface and to store this data for additional batch-mode statistical evaluation.

10.5 System traffic throughput test data set input. Test data set data input formats shall be in accordance with the formats defined in Appendix IV and Appendix V of the WMSCR Specification. The minimum test data set input magnitudes to be utilized are documented in Table 3. The weather product information in the headers shall be consistent with the entries in the PIDB. The date/time field shall be set so there will be no duplicate weather messages except those initiated to test duplication security. The meteorological content of each weather message may be random strings of the alphabet (i.e. ABDC....XYZ). NOTAM messages shall be content unique thus permitting post-retrieval content verification. The report identifications generated by the simulator shall be a controlled random sequence distributed to reflect the actual WMSCR operational environment consistent with that defined for reporting stations. Traffic arriving on the NWSTG circuit shall be divided into breakdown and non-breakdown products.

10.6 System traffic throughput test data set output. The WMSCR PIDB and PADB define the product distribution and shall be configured to distribute the input interface data magnitudes defined in Table 3 to the respective output interface data magnitudes defined in Table 6. The output data magnitude distribution shall be in accordance with the hourly output schedule documented in Table 5. The input group Z, in Table 6, represents the data produced by the product assembly function which shall conform to the product assembly schedule documented in Table 4. The Product Assembly Data Base (PADB) shall control the product assembly function.

Table 3 WMSCR Hourly Input Traffic

Source Group:	A	B	C	D	E	F	G
sink group(s):	C,E,F G,H,I K,L,S	A,E,K S	D,H, L,S	C,H,I K,L,M, N,S	A,B,C I,R,S	C,E,G I,S	I,C,E S
peak interface throughput:	398	9	301.6	22	314	5.8	90.2
100% throughput margin:	398	9	301.6	22	314	5.8	90.2
test set interface throughput:	796	18	603.2	44	628	11.6	180.4

A -- NWSTG
B -- MWP
C -- AWP
D -- CNSP
E -- RWP-A/N, Graphics
F -- NSSFC
G -- KAWN
H -- PAD
I -- SAS
J -- ADAS
K -- WCP
L -- ATA
M -- FSDPS-1
N -- 9020/HOST
P -- AFTN
Q -- TMP
R -- CFMWP
S -- Internal Storage
Z -- Internal Assembly

All throughput units represented in kilobytes except where noted.

Source Group:	H	I	J	K	L	M	N	P	Q	R
sink group(s):	N/A	D,S	A,C,S	N/A	S	D,S	S	S	N/A	N/A
peak interface throughput:	0	39.15	387	0	.95	3.6	2.3	.04	0	0
100% throughput margin:	0	39.15	387	0	.95	3.6	2.3	.04	0	0
test set interface throughput:	0	78.30	774	0	1.90	7.2	4.6	.08	0	0

A -- NWSTG
B -- MWP
C -- AWP
D -- CNSP
E -- RWP-A/N, Graphics
F -- NSSFC
G -- KAWN
H -- PAD
I -- SAS
J -- ADAS
K -- WCP
L -- ATA
M -- FSDPS-1
N -- 9020/HOST
P -- AFTN
Q -- TMP
R -- CFMWP
S -- Internal Storage
Z -- Internal Assembly

All throughput units represented in kilobytes except where noted.

Table 4 WMSCR Hourly Product Assembly Schedule

Minute	% Of Total Hourly Product Assembly
:00-05	20%
:06-11	10%
:12-17	10%
:18-23	5%
:24-29	20%
:30-35	10%
:36-41	5%
:42-47	10%
:48-53	5%
:54-59	5%
TOTAL	100%

Table 5 WMSCR Hourly Output Distribution Schedule

Minute	% Of Total Hourly Output Distribution
:00-05	5%
:06-11	20%
:12-17	10%
:18-23	10%
:24-29	5%
:30-35	20%
:36-41	10%
:42-47	5%
:48-53	10%
:54-59	5%
TOTAL	100%

Table 6 WMSCR Hourly Output Traffic

Sink Group:	A	B	C	D	E	F	G
source group(s):	E,J,Z	A,B, F,G, R,S	A,D,E, F,G,J, Z	C	A,B,F, G,Z	A,E,Z	A,E,F Z
peak interface throughput:	240	5640	1420	4	22875	237.1	127.2
100% throughput margin:	240	5640	1420	4	22875	237.1	127.2
test set interface throughput:	480	11280	2840	8	45750	474.2	254.5

A -- NWSTG	F -- NSSFC	K -- WCP	Q -- TMP
B -- MWP	G -- KAWN	L -- ATA	R -- CFMWP
C -- AWP	H -- PAD	M -- FSDPS	S -- Internal Storage
D -- CNSP	I -- SAS	N -- 9020/HOST	
E -- RWP-A/N, Graphics	J -- ADAS	P -- AFTN	Z -- Internal Assembly

All throughput units represented in kilobytes except where noted.

Sink Group:	H	I	J	K	L	M	N	P	Q	R
source group(s):	A,D F,Z	A,E,F G,Z	N/A	A,D,F G,I,Z	A,E,F G,Z	N/A	N/A	N/A	A,S	A,B I
peak interface throughput:	9.28	1292.8	0	8183	895.7	694.75	348.8	183.8	50	491
100% throughput margin:	9.28	1292.8	0	8183	895.7	694.75	348.8	183.8	50	491
test set interface throughputs:	18.56	2585.6	0	16366	1791.4	1389.5	697.6	367.6	100	982

A -- NWSTG	F -- NSSFC	K -- WCP	Q -- TMP
B -- MWP	G -- KAWN	L -- ATA	R -- CFMWP
C -- AWP	H -- PAD	M -- FSDPS	S -- Internal Storage
D -- CNSP	I -- SAS	N -- 9020/HOST	
E -- RWP-A/N, Graphics	J -- ADAS	P -- AFTN	Z -- Internal Assembly

All throughput units represented in kilobytes except where noted.

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APPENDIX II

20. UNIVERSAL PRODUCT IDENTIFIER (UPI) AND UNIVERSAL REPORT IDENTIFIER (URI)

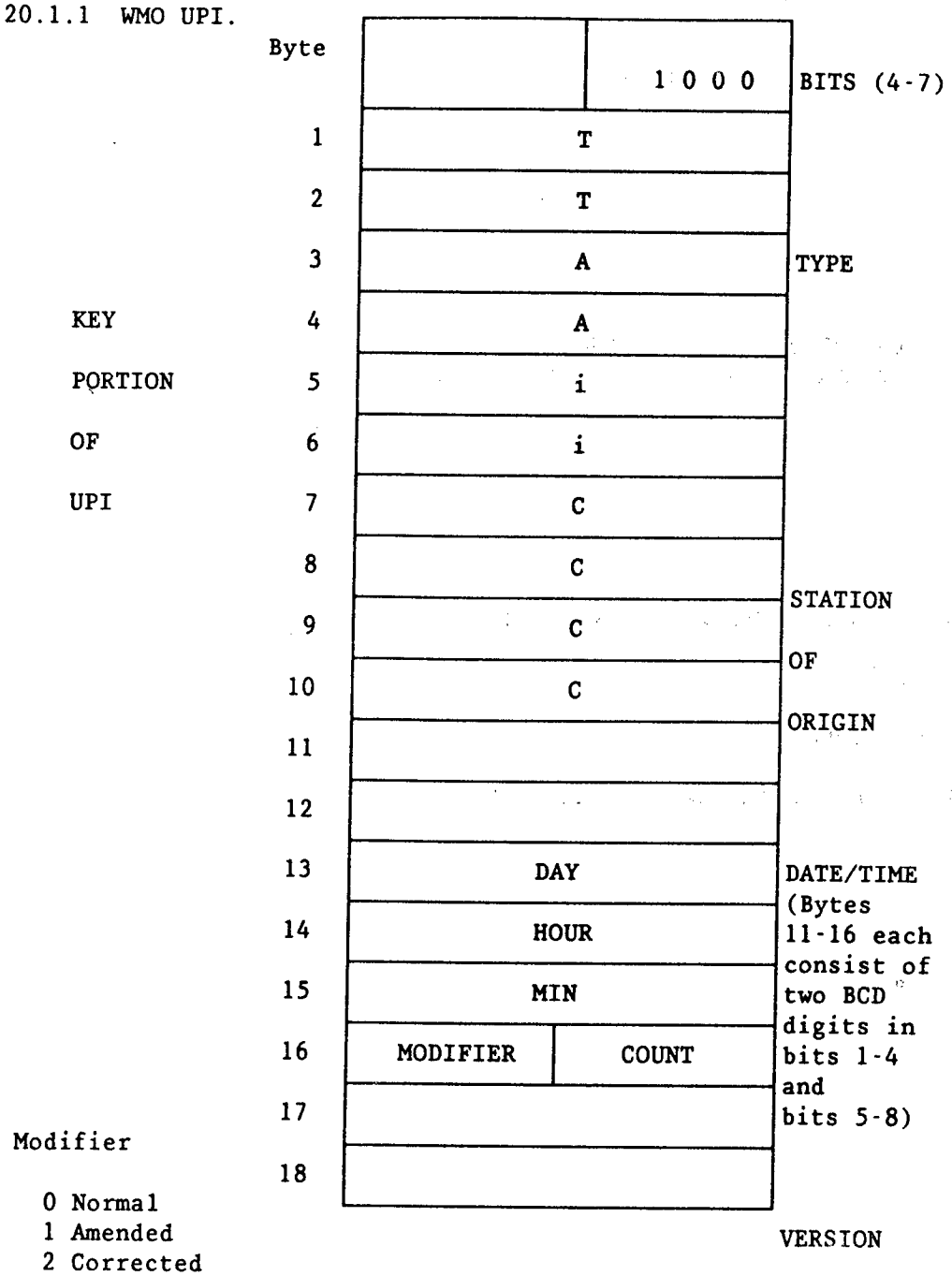
20.1 Universal Product Identifier (UPI).

20.1.1 WMO UPI.

20.1.2 FCM-S2 UPI.

20.2 Universal Report Identifier (URI).

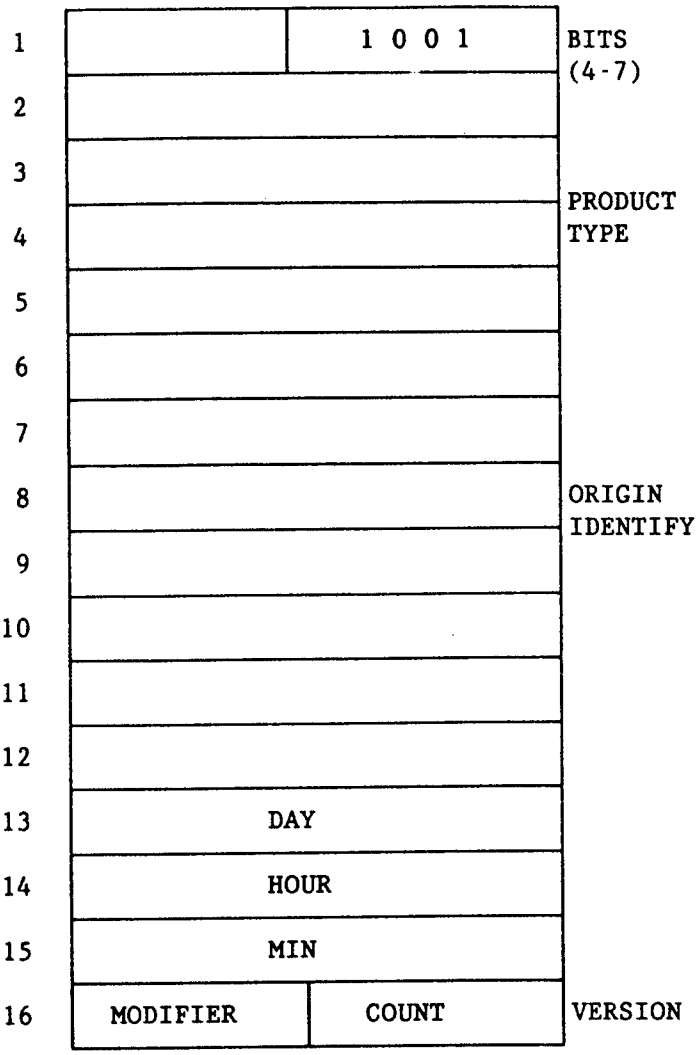
20.1.1 WMO UPI.



Modifier

0 Normal
1 Amended
2 Corrected
3 Retarded

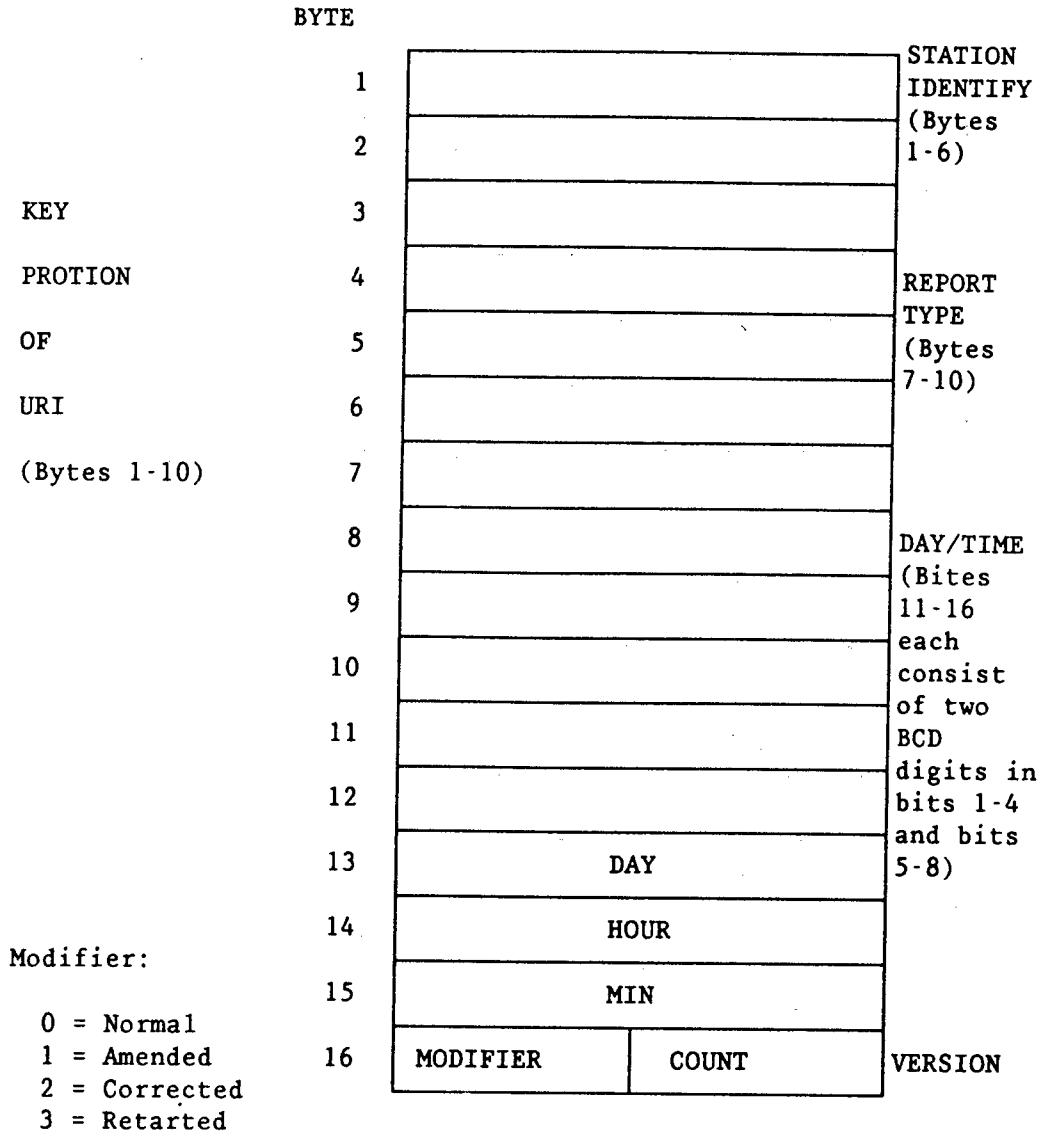
20.1.2 FCM DATA UPI



Modifier:

0 = Normal
1 = Amended
2 = Corrected
3 = Retarded

20.2 Universal Report Identifier (URI).



APPENDIX III

30. FORMATS OF WMSCR APPLICATION DATA UNITS

30.1 Application Data Unit (ADU) organizational overview.

30.2 WMO Application Data Unit.

30.3 FCM-S2 Application Data Unit.

30.4 Report Application Data Unit.

30.5 NOTAM Application Data Unit.

30.6 Data request Application Data Unit.

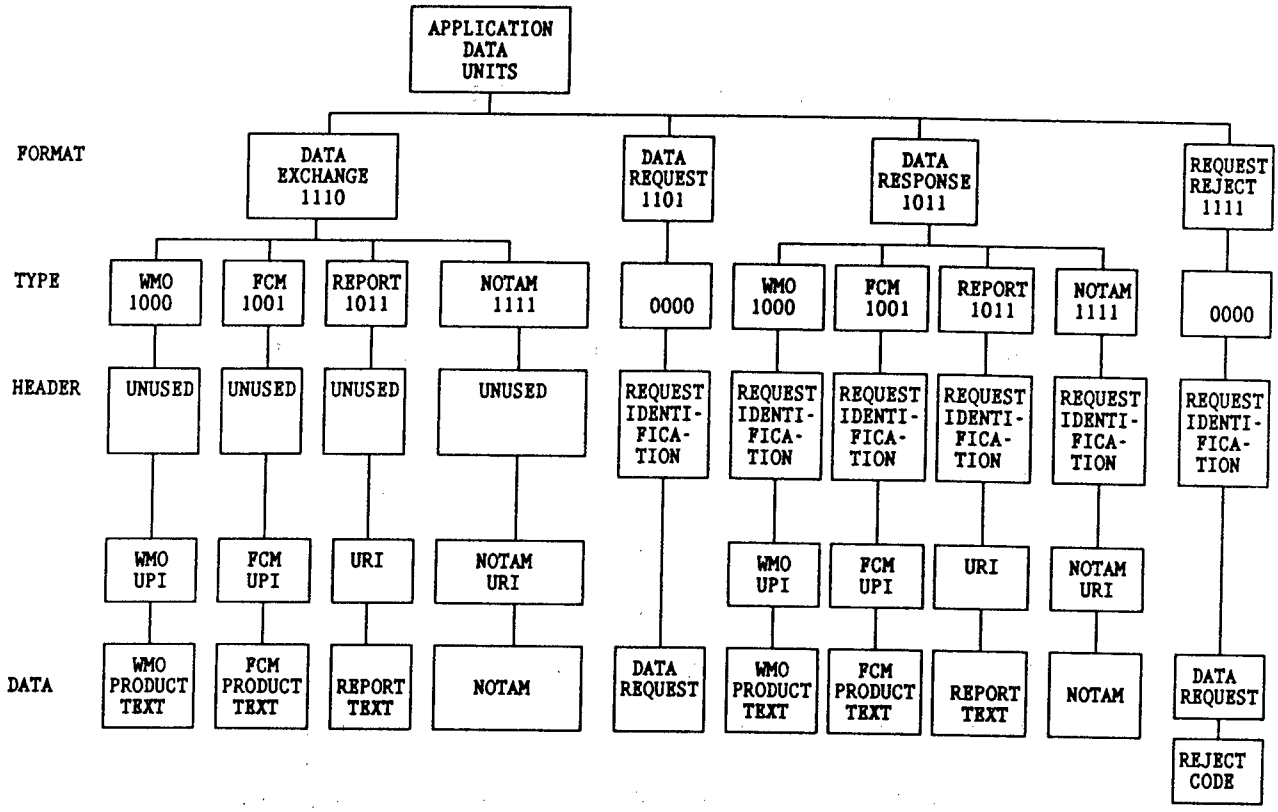
30.7 Data response Application Data Unit for WMO data.

30.8 Data response Application Data Unit for report data.

30.9 Data response Application Data Unit for NOTAM data.

30.10 Data request reject Application Data Unit.

30.1 WMSCR APPLICATION DATA UNIT (ADU) ORGANIZATIONAL OVERVIEW.

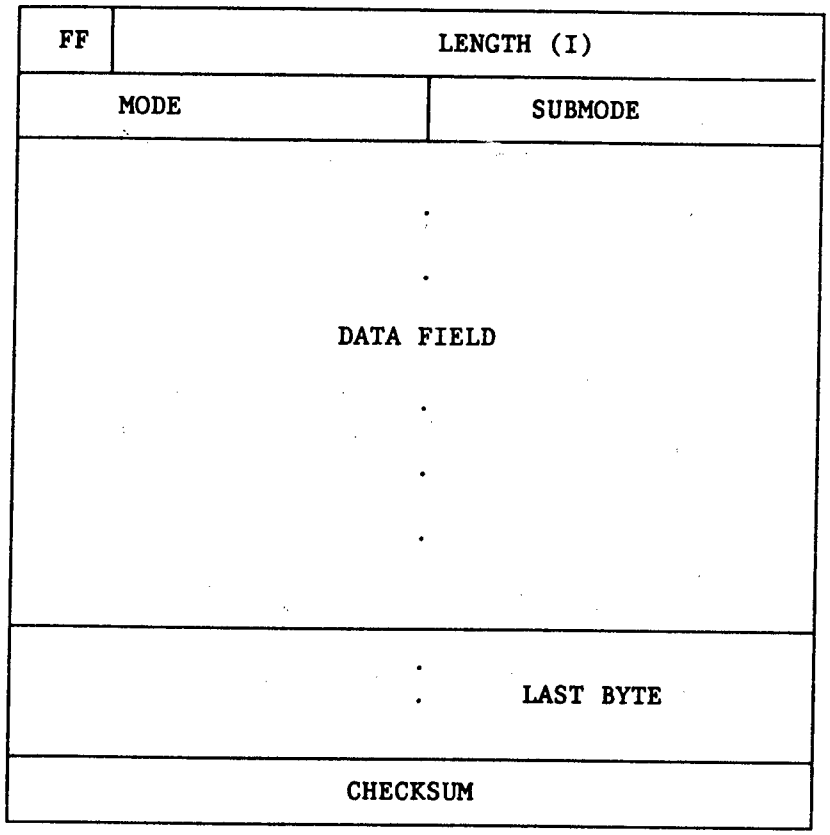


30.2 WMO ADU.

Byte	Format (Bits 1-4) Type (Bits 5-8)			
1	11101000			
2	C A T A L O G N U M B E R			
6		SP	CR	CR
10	LF	STX	T	T
14	A	A	i	i
18	SP	C	C	C
22	C	SP	Y	Y
26	G	G	g	g
30	CR	CR	LF	RS*
34	W M O T E X T			
	CR	CR	LF	RS

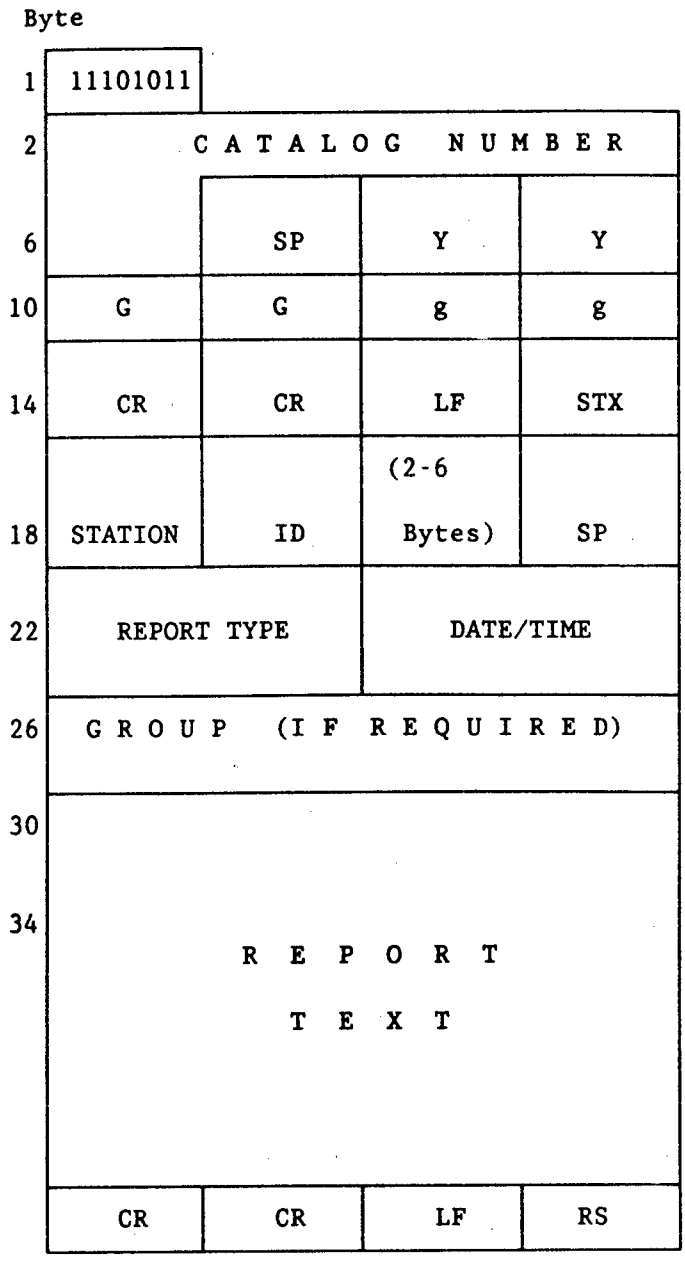
* RS before text is for breakdown products only

30.3 FCM ADU.


2**15
2**0
FF
LENGTH (I)
MODE
SUBMODE
DATA FIELD
LAST BYTE
CHECKSUM

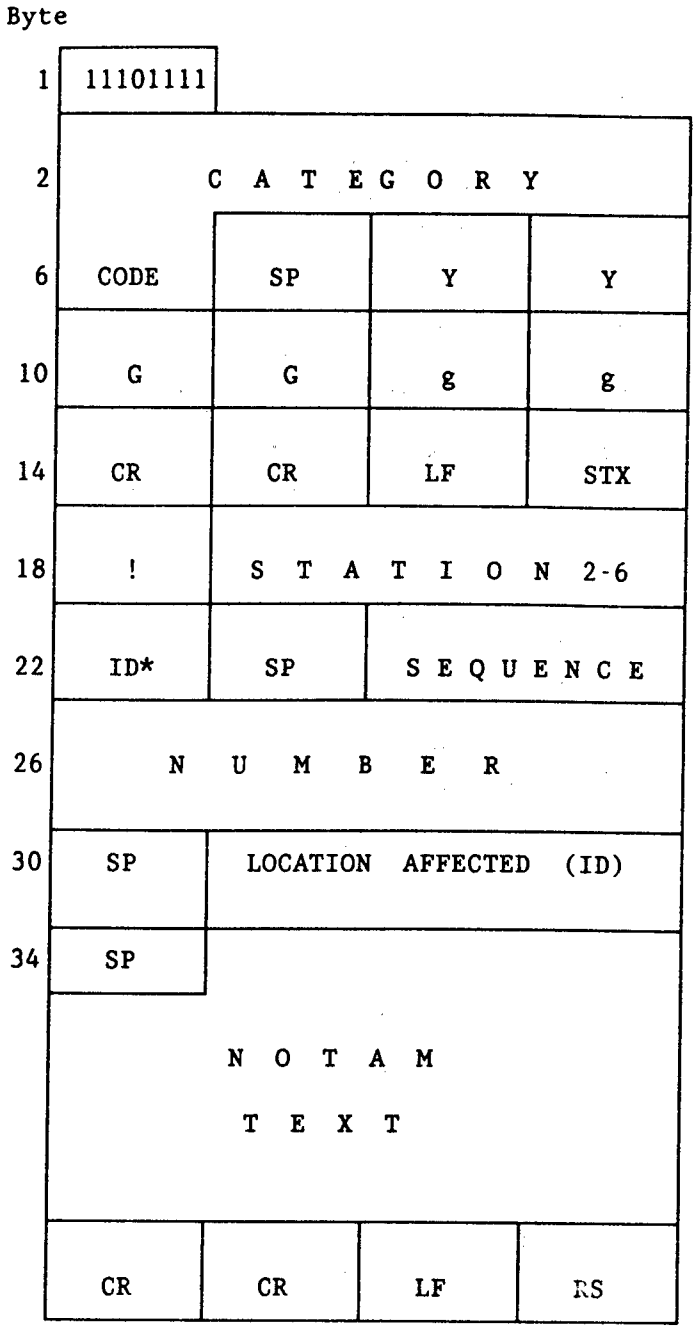
30.4 Report ADU.

Format (Bits 1-4)
Type (Bits 5-8)



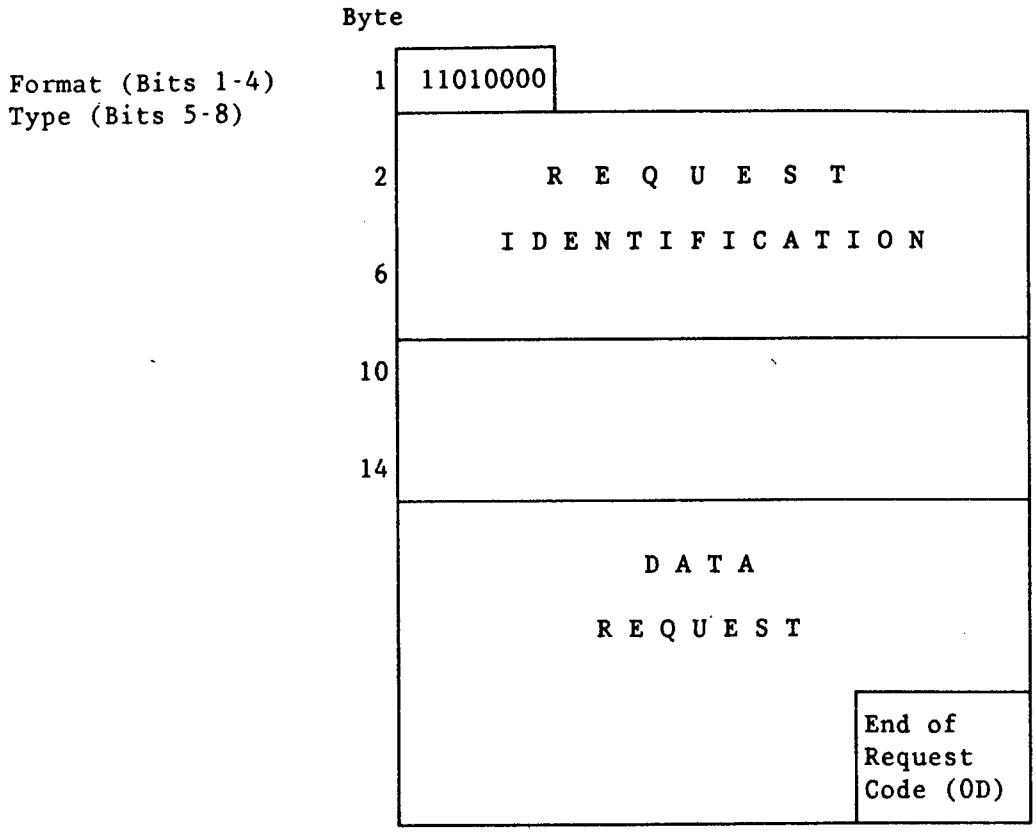
30.5 NOTAM ADU.

Format (Bits 1-4)
Type (Bits 5-8)

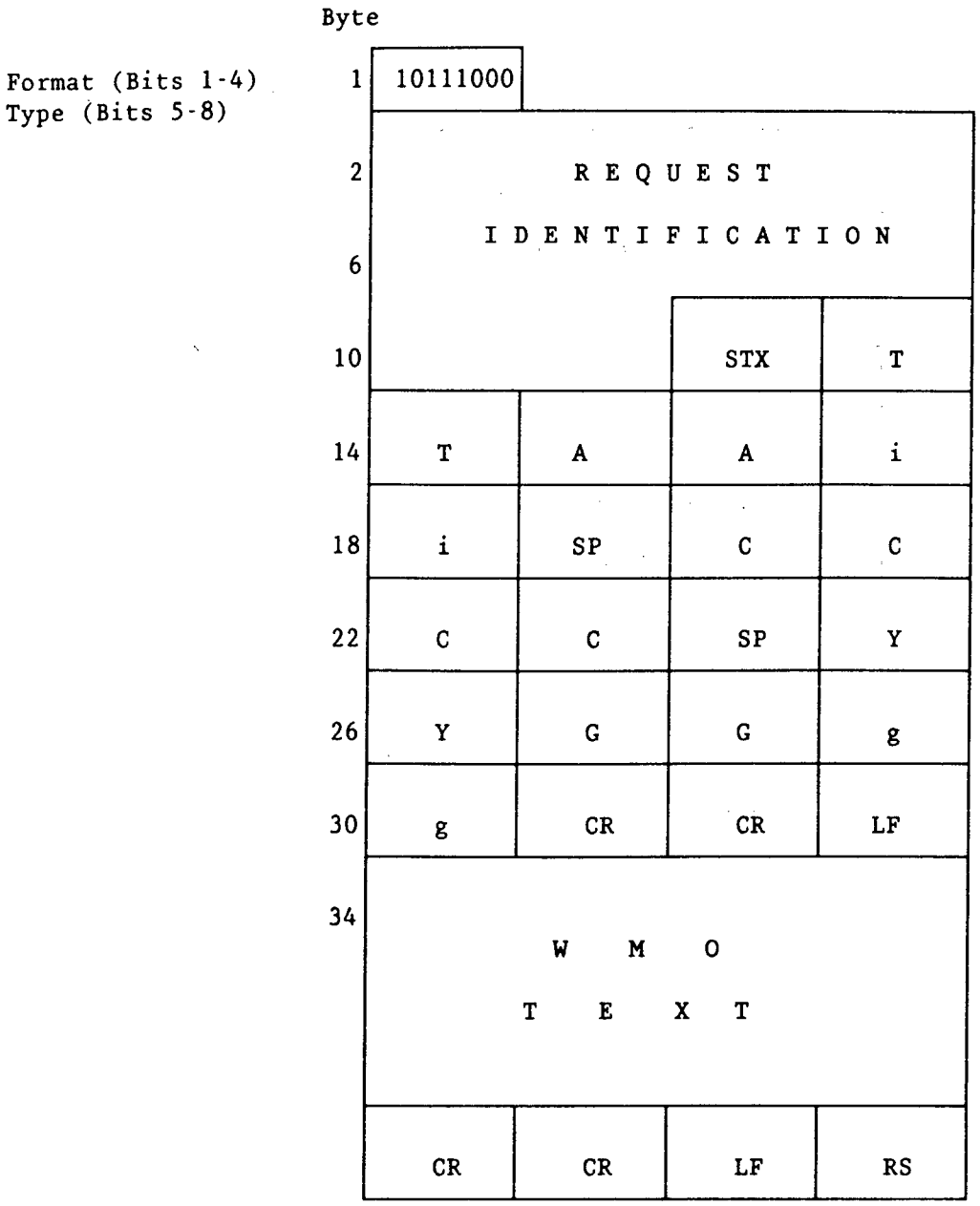


*Station ID could be 2-6 characters

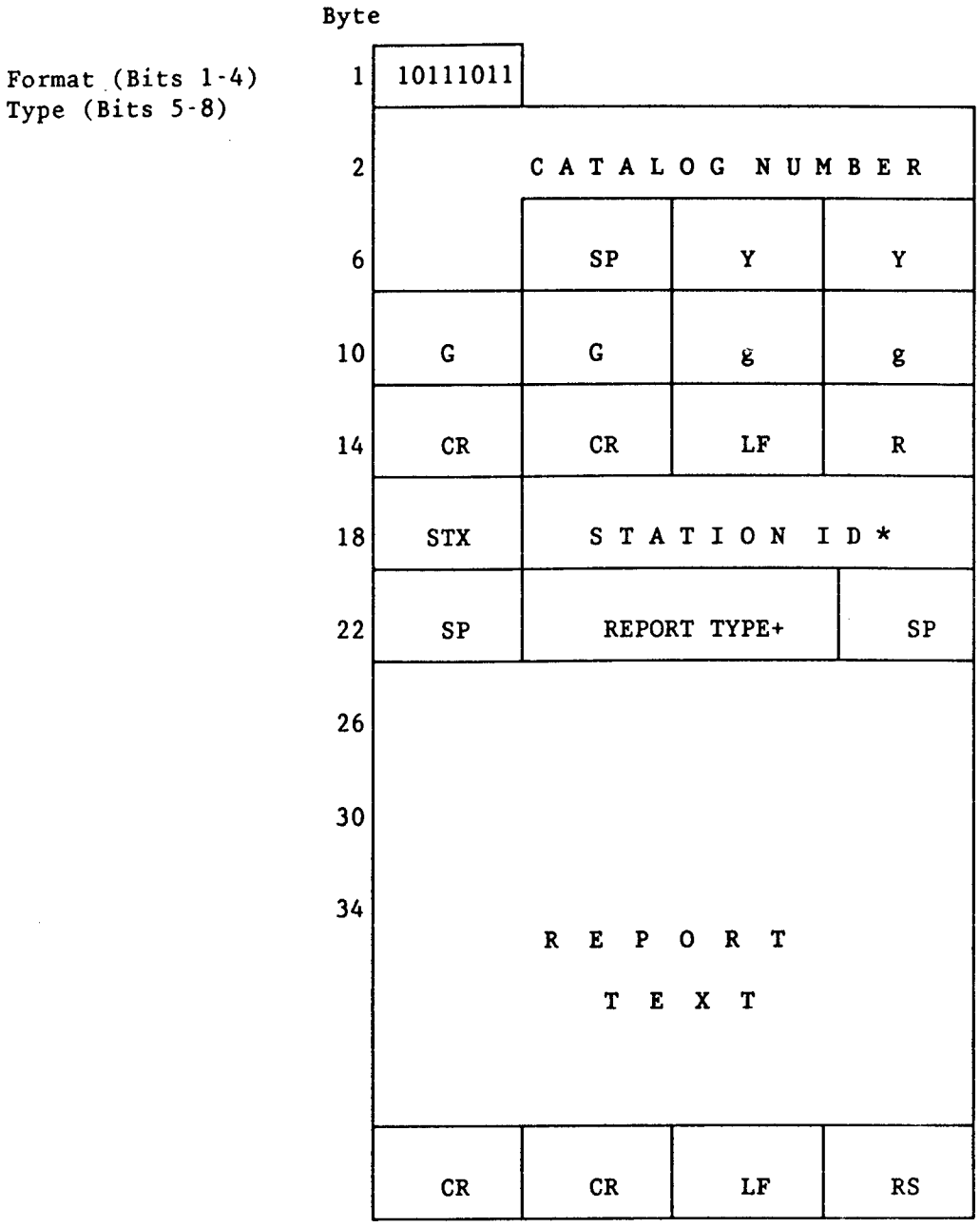
30.6 Data request ADU.



30.7 Data response ADU for WMO data.



30.8 Data response ADU for report data.



* 3 to 6 characters
\+ 2 to 6 characters

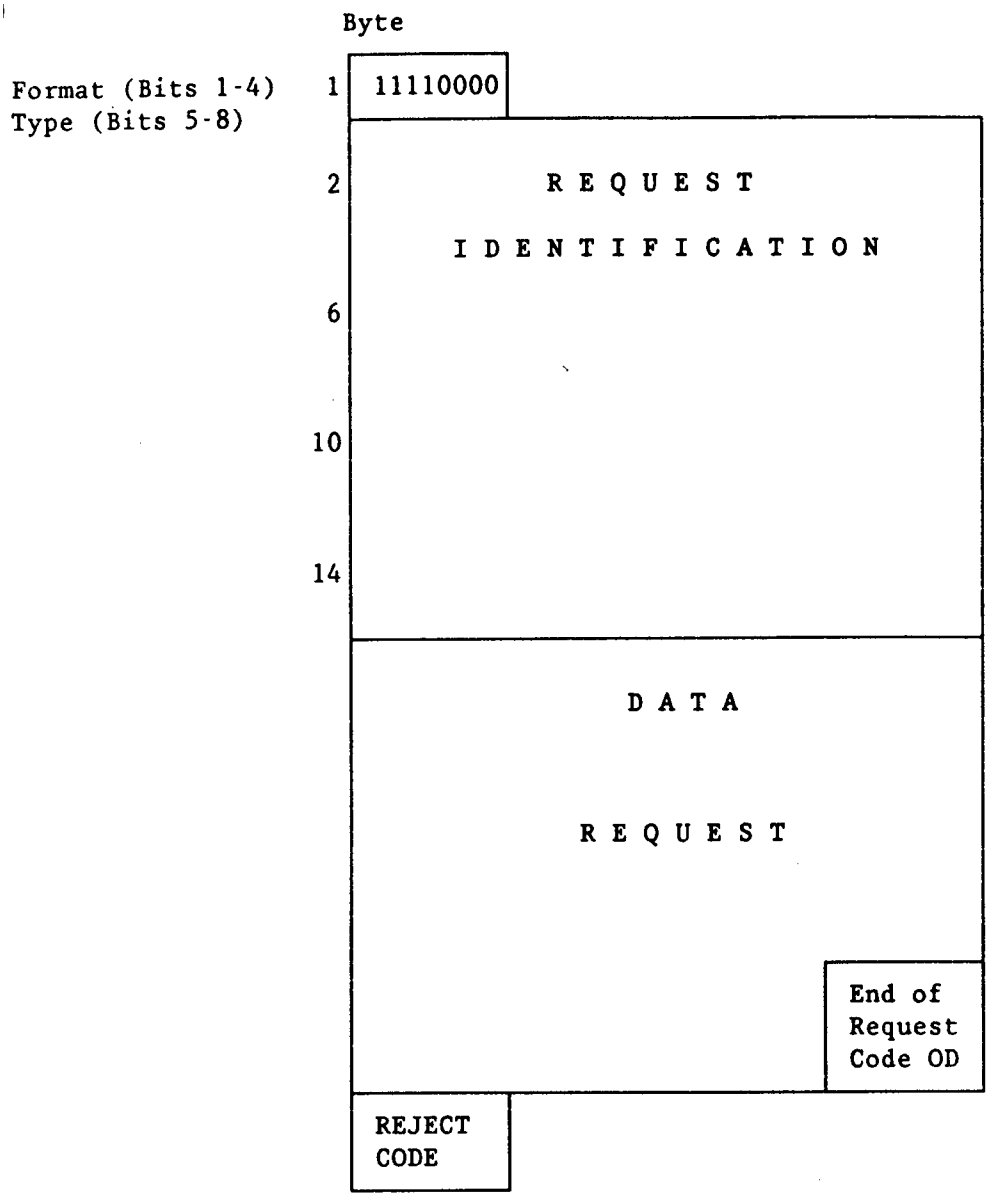
30.9 Data response ADU for NOTAM data.

Format (Bits 1-4)
Type (Bits 5-8)

Byte				
1	10111111			
2	C A T E G O R Y C O D E			
6		SP	Y	Y
10	G	G	g	g
14	CR	CR	LF	R
18	STX	!	S T A T I O N	
22	I D *		S E Q U E N C E	
26	N U M B E R			
30	SP	LOCATION AFFECTED (ID)		
34	SP			
	N O T A M T E X T			
	CR	CR	LF	RS

*Station ID - Normally 3 characters, could be 4. System capable of handling up to 6 characters.

30.10 Data request reject ADU.



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APPENDIX IV

40. DATA REQUEST FORMATS

40.1 Syntax of WMSCR data retrieval language.

40.1.1 General concept. The data retrieval textual language defines a syntax for requesting data from the WMSCR weather data base(s). The retrieval facility of WMSCR shall interpret the request and return to the responder a block of text or binary data satisfying the request criteria. A textual language has certain advantages over the alternative approach of using fixed format data request blocks. It allows a greater variety of retrieval options and flexibility for change without the rigidity associated with fixed formats. It is also generally suitable for direct entry by human operators.

40.1.2 Compatibility with current WMSC procedures. As a subset, the textual language will include all currently supported data retrieval procedures as defined in FAA 7110.80.

40.1.3 Basic data request format. A data request consists of a single text line beginning with a command word. It has the following basic format:

COMMAND parameter-1 (parameter-2)...(parameter-n)

The command word indicates the overall retrieval function. The parameters further specify the data to be retrieved. The command can be shortened to the smallest unambiguous abbreviation that does not conflict with another command (usually a single letter). The delimeter character between parameters shall be a blank. The end of the request text is marked by a carriage return character, hexidecimal 0D.

40.1.4 Overview of data request commands. The following commands shall be supported:

W(MO) This command requests a product by its WMO identification.

F(CM) This command requests a product by its FCM-S2 identification.

RE(PORT) This command requests reports.

L(IST) This command requests products and/or reports that are defined in predefined lists of WMO, FCM, and REPORT commands.

RQ This command requests up to ten reports from specified stations. This command is currently supported by WMSC and shall continue to be supported by WMSCR.

RC This command requests up to five products by their WMO identification. This command is currently supported by WMSC and shall continue to be supported by WMSCR.

RL This command requests products or reports defined in a numbered list composed of RQ and RC requests. This command is currently supported by WMSC and shall continue to be supported by WMSCR.

40.1.5 WMO command. The WMO command is used to request one or more products in WMO format from the WMSCR product data base. The full format of the WMO data request is:

W(MO) TTAAii CCCC (date-time) (modifier) (quantity)

The meanings of each field is defined below:

W(MO) This is the command which can be abbreviated to a single character "W".

TTAAii This field is the WMO product identifier. TT is the data type. AA is the country of origin. ii is a unique product number. Any position can contain an automatic match character (?). This field must be present as the first parameter.

CCCC This field is the WMO center of product origin. Together with TTAAii it defines the product. Any position can contain an automatic match character (?). This field must be present as the second parameter.

date-time	This field defines the desired time(s) of the requested product(s). If this field is omitted, the most recent product is assumed. The formats permitted in the date time field are described in 40.1.12.
modifier	This field specifies the desired version number of the requested product. This field must be formatted as per the WMO modifier field (e.g. 'AMD', 'RTD', 'COR').
quantity	This field defines how many products are requested. This field may contain a value in the range of 1-99. If omitted, a value of 1 is assumed.

40.1.6 FCM command. The FCM command is used to request one or more products in FCM-S2 format from the WMSCR product data base.

40.1.7 REPORT command. This command is used to request one or more reports from the WMSCR report data base(s). The full format of the command is:

RE(PORT) type station(s) (date-time) (quantity)

The meanings of each field is defined below:

RE(PORT)	This field is the command and can be abbreviated to 'RE'.
type	This field is the two-character WMO report-type field, TT, as found in the TTAAii field. This field must be present.
station(s)	This field specifies one or more reporting stations. The allowable formats for this field are defined in 40.1.13. This field must be present.
date-time	This field defines the times of the requested reports. If this field is omitted, the latest version is implied. The format of the date-time field is defined in 40.1.12.
quantity	This field will limit how many reports are to be returned from each station. It may have a value of 1-99. If omitted, 1 is assumed.

40.1.8 LIST command. This command is used for requesting a predefined list of products and reports. This command will operate as if multiple requests had been entered. The specified list shall contain one or more WMO, UTF, or REPORT commands. The format of the command is:

L(IST) list-name

The meaning of each field is defined below:

L(IST)	This is the command filed that can be abbreviated to 'L'.
list-name	This field is the name of a predefined file containing one or more WMO, FCM, or REPORT requests.

40.1.9 RQ command. This command is in the format currently supported by the WMSC. It is used to request up to ten reports. The exact functioning of this command is described in FAA 7110.80. The format of the command is:

RQ station-name type (station-name type-2)...(station-name type-10)

There can be up to ten pairs of station name/type following the command. The meaning of the command is:

RQ	This is the command field.
station-name	This field specifies one station name.
type	This field specifies the character report type (up to four characters in length).

40.1.10 RC command. This command is currently supported by the WMSC. It is used to request the latest version of up to five products by their individual WMO identifiers. The exact functioning of this command is described in FAA 7110.80. The format of the command is:

RC TTAAii CCCC (TTAAii CCCC-2)...(TTAAii CCCC-5)

The meaning of the fields are:

RC .	This is the command field.
TTAAii	This field must specify a valid WMO type field without any automatic match characters (?).
CCCC	This field must specify a valid WMO origin center without any automatic match characters. This field together with the TTAAii forms the Universal Product Identifier (UPI) for a product in the WMSCR data base.

40.1.11 RL command. This command is currently supported by the WMSC. It is used to execute a predefined set of data requests defined in a numbered list. The exact functioning of this command is described in FAA 7110.80. The format of the command is:

RL list-number

The meanings of the fields are:

RL This is the command field.

list-number This field is the number of a predefined list of RQ and RC data requests.

40.1.12 Date-time group formats. The date-time field shall represent a specific time or a range of times. The month and year value are assumed to be those appropriate for the prior 30 days. There are 12 different date-time formats permitted:

a. A specific fully defined time:
ddhhmm

b. A specific hour in GMT:
hhZ

c. A specific hour relative to the current hour:
-hh

d. A range of fully defined times:
ddhhmm/ddhhmm

e. A range of hours in GMT:
hhZ/hhZ

f. A range of hours relative to the current hour:
-hh/-hh

g. A range of time since a fully defined time:
/ddhhmm

h. A range of time since an hour in GMT time:
/hhZ

i. A range of time since an hour relative to the current hour:
/-hh

j. A range of time before a fully defined time:
ddhhmm/

k. A range of time before an hour in GMT:
hhZ/

l. A range of time before an hour relative to the current hour:
-hh/

40.1.13 Station list formats. Whenever the syntax calls for a station name, one of three formats can be specified.

a. A single station, e.g.:

LAX
72361
EGRR

b. A list of stations, e.g.:

LAX,PHX,SAN,SFO
72361,72899,72400,72128
LGAT,OEJD

c. A predefined station set, e.g.:

CALIFORNIA
NYMETRO
GULFCOAST

40.1.14 Automatic match feature. The data request language shall permit requests in which the search criteria are not fully defined. To accomplish this capability, one or more of the parameter fields shall contain the automatic match character. This character is the question mark (?). The following data request fields can contain the automatic match character:

a. TTAAii

b. CCCC

40.2 Examples of data request ADUs.

40.2.1 WMO absolute product request.

Byte								
1	DO							
2		U S E R D A T A						
10	W		T	T	A	A	i	i
18		C	C	C	C		D	D
26	H	H	M	M		B	B	B
34	OD							

40.2.2 WMO latest product request.

Byte								
1	DO							
2		U S E R D A T A						
10	W		T	T	A	A	i	i
18		C	C	C	C	OD		

40.2.3 WMO products within time range request.

Byte								
1	DO							
2		U	S	E	R	D	A	T A
10	W		T	T	A	A	i	i
18		C	C	C	C		H	H
26	Z	/	H	H	Z	OD		

40.2.4 Request for latest FT report from three stations.

Byte								
1	DO							
2		U	S	E	R	D	A	T A
10	R	E		F	T		J	F
18	K	,	A	T	L	,	D	F
26	W	OD						

40.2.5 Request for last six UA reports from one station

Byte								
1	D0							
2		U S E R D A T A						
10	R	E		U	A		O	R
18	D		6	OD				

40.2.6 Request for time range of SA reports from predefined station called "East".

Byte								
1	D0							
2		U S E R D A T A						
10	R	E		S	A		E	A
18	S	T		1	2	Z	/	I
26	7	Z	OD					

40.2.7 Request for a predefined list of data called "DENSLC".

Byte								
1	DO							
2		U S E R D A T A						
10	L		D	E	N	S	L	C
18	OD							

40.2.8 RQ request.

Byte								
1	DO							
2		U S E R D A T A						
10	R	Q		H	P	N		S
18	A		B	D	R		S	A
26	H	V	N		S	A	OD	

APPENDIX V

50. WMO MESSAGE FORMAT

2. PROCEDURES APPLICABLE TO THE TRANSMISSION OF METEOROLOGICAL DATA ON THE GLOBAL TELECOMMUNICATION SYSTEM

2.1 Format of meteorological messages

2.1.1 A routine meteorological message transmitted on the Global Telecommunication System shall comprise:

- A starting line
- An abbreviated heading
- A text

(Meteorological bulletin)

- End-of-message signals

(Meteorological message)

2.1.2 There shall be only one meteorological bulletin per meteorological message.

2.1.3 A non-routine meteorological message shall have the format of an addressed message (see 2.4 below)

2.2 Alphabets used for transmissions

2.2.1 The alphabets to be used on the GTS shall be the following:

(*a*) International Telegraph Alphabet No. 2;

(*b*) International Alphabet No. 5.

2.3 Message format for routine meteorological messages

The procedures outlined below shall apply to transmission of routine meteorological messages on the GTS.

2.3.1 *Starting line*

2.3.1.1 The starting line shall have the following format:

(*a*) International Telegraph Alphabet No. 2:

≪ ≡ ↓ ZCZC → ↕ nnn (→ CLLLL) →→→→→→

NOTE: The use of the CLLLL groups, enclosed in parentheses, is optional. The use of this group is a matter for regional or national decision.

(*b*) International Alphabet No. 5:

NOTE: An example of a routine meteorological message and the meaning of the symbols used for the signals in both International Telegraph Alphabet No. 2 and International Alphabet No. 5 are given in Attachment II-4.

2.3.1.1 The symbols shall have the following meanings:

TT — Data designator.

AA — Geographical designator.

NOTE The WMO standard data designators and geographical designators are given in Attachment II-6.

ii — Number used to differentiate two or more bulletins which contain data in the same code and which originate from the same geographical area and have the same originating centre. It shall be a number with a maximum of two digits.

The use of "ii" is mandatory in both International Telegraph Alphabet No. 2 and International Alphabet No. 5 for all bulletins using the data designators.

NOTE See Attachment II-6, Table A — Data designators for alphanumeric information.

The following sets of "ii" numbers shall be used for indicating the bulletins for global, inter-regional, regional and national distribution. However, special more flexible provisions apply to the use of "ii" in respect of bulletins containing satellite data, processed information in GRID-point format and pictorial information in digital form. (See details in respect of individual centres contained in WMO Publication No. 9, Volume C, Chapter I, "Catalogue of meteorological bulletins".)

ii = 1–19 inclusive for global distribution;

ii = 20–39 inclusive for regional and inter-regional distribution;

ii = 40–89 inclusive for national and bilaterally agreed distribution;

ii = 90–99 reserved.

2.3.1.2 The symbols have the following meanings:

nnn — Transmission sequence number. It is a three-digit group giving the transmission sequence of messages from one centre over a particular channel to the receiving centre on that channel. Numbers 000 to 999 inclusive must be used in a cyclic manner. (When International Alphabet No. 5 is used, the group nnn may be a fixed combination of three characters, if agreed between the centres concerned.)

CLLLL — Classification and identification group in the general catalogue of bulletins. The group CLLLL is mandatory when International Alphabet No. 5 is used. It facilitates the processing and switching operations at telecommunication centres.

It should preferably be inserted at the NMCs but, in any case, CLLLL shall be used on all segments of the Main Trunk Circuit, regardless of which alphabet is being used. It should also be used on the main regional circuits and the regional circuits as required by the RTHs concerned (see Functions of the RTHs, paragraph 2.2 of Part I).

NOTE The specifications of CLLLL are given in Attachment II-5.

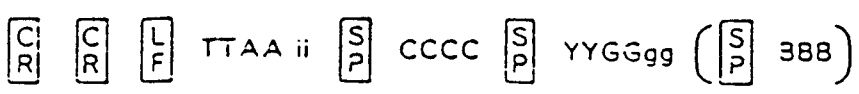
2.3.2 *Abbreviated heading*

2.3.2.1 The abbreviated heading shall have the following format:

(*a*) International Telegraph Alphabet No. 2:

≪ ≡ ₊ TTAA ᴬ ii — ₊ CCCC — ᴬ YYGGgg (— ₊ BBB)

(*b*) International Alphabet No. 5:



In the case of bulletins containing observational data and climatic data (surface and upper-air) from land stations, one "ii" number shall be allocated to one bulletin containing a fixed list of stations. This list may be different at different hours, provided it is known, and that it is given in the Catalogue of Meteorological Bulletins.

In the case of bulletins containing ships' weather reports and aircraft reports, the number of "ii" should be limited to a maximum of six. In order to facilitate the selective distribution of ships' weather reports (surface and upper-air), whenever practicable a fixed number of "ii" should be allocated to the bulletins for those reports which are collected from a certain area within each Region (e.g. southern Indian Ocean in Region I, southern Atlantic in Region III, etc.).

All information concerning the number "ii" and the contents of bulletins shall be published in the Catalogue of Meteorological Bulletins.

NOTE: The Catalogue of Meteorological Bulletins is given in WMO Publication No. 9, Volume C.

CCCC — International four-letter location indicator of the station originating or compiling the bulletin, as agreed bi-laterally or multi-laterally, and published in WMO Publication No. 9, Volume C, Chapter I, "Catalogue of meteorological bulletins". Once a bulletin has been originated or compiled, the CCCC must not be changed even if (because of inadequate reception, or for any other reason) the bulletin in question has to be re-compiled at another centre.

YYGGgg — International date-time group

YY — Day of month

GGgg — For bulletins containing meteorological reports the time shall be the standard time of observation in GMT;

— For aerodrome, route and area (aeronautical) forecasts: the full hour in GMT (the last two digits shall be 00) preceding the transmission time; for other forecasts and analyses: standard time of observation in GMT on which forecast or analysis is based;

— For other messages the time shall be the time of origin in GMT.

888 — An abbreviated heading defined by TTAAii CCCC YYGGgg shall be used only once. Subsequently, if this abbreviated heading has to be used again for an addition or correction, it shall be mandatory to add an appropriate 888 indicator, identified by a three-letter indicator which shall be added after the date-time group.

The following indicators shall be used:

RTD — for delayed routine weather reports
COR — for correction to reports
AMD — for amendments to processed information

FOLLOWING IS A QUOTE FROM METEOROLOGICAL TELECOMMUNICATIONS PROCEDURES, WMO PUB NO. 386, AMEND NO. 31(X.1983):

"BBB -- AN ABBREVIATED HEADING DEFINED BY TTAAII CCCC YYGGGG SHALL BE USED ONLY ONCE. CONSEQUENTLY, IF THIS ABBREVIATED HEADING HAS TO USED AGAIN FOR AN ADDITION OR CORRECTION, IT SHALL BE MANDATORY TO ADD AN APPROPRIATE BBB INDICATOR, IDENTIFIED BY A THREE-LETTER INDICATOR WHICH SHALL BE ADDED AFTER THE DATE-TIME GROUP.

THE INDICATOR BBB SHALL HAVE ONE OF THE FOLLOWING FORMS(A) OR (B) AS GIVEN BELOW:

(A) RTD --FOR DELAYED ROUTINE WEATHER REPORTS;
COR --FOR CORRECTION REPORTS;
AMD --FOR AMENDMENTS TO PROCESSED INFORMATION;

(B) IN ORDER THAT RETARD(RTD), CORRECTION(COR), AND AMENDMENT (AMD) BULLETINS MAY BE INDIVIDUALLY IDENTIFIED, THEY SHALL BE ISUUED IN SEQUENCE USING (IN PLACE OF RTD, COR AND AMD) THE SERIES RRA,RRB,RRC ETC., CCA,CCB,CCC ETC., AND AAA,AAB, AAC ETC. AND SO ON THROUGH THE ALPHABET.

NOTE: THIS CHANGE SHOULD BE IMPLEMENTED BY ALL GTS CENTRES AS SOON AS POSSIBLE AFTER(BUT NOT BEFORE) 15 JANUARY 1984."

2.3.4 *End-of-message signals*

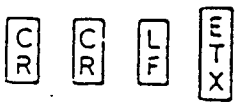
The format for the end-of-message signals shall be as follows:

(*a*) International Telegraph Alphabet No. 2:

↓ ≪ ≡ ≡ ≡ ≡ ≡ ≡ ≡ ≡ NNNN ↓↓↓↓↓↓↓↓↓↓↓↓

NOTE. The end-of-message signals are used for ensuring page-feed and tape-feed.

(*b*) International Alphabet No. 5



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APPENDIX VI

60. VECTOR GRAPHIC PRODUCT FORMAT

60.1 Vector Graphic Product Format shall be in accordance with FCM-S2, Standard Formats for Weather Data Exchange Among Automated Weather Information Systems.

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APPENDIX VII

70. ICAO MESSAGE FORMAT

4.4.18.1.1.5 RECOMMENDATION.— *The expansion of the channel-sequence number to preclude duplication of the same numbers during the 24-hour period should be permitted subject to agreement between the Authorities responsible for the operation of the circuit.*

4.4.18.1.1.6 The Transmission Identification shall be sent over the circuit in the following sequence:

a) Transmitting-terminal letter

b) Receiving-terminal letter

c) Channel-identification letter

d) Channel-sequence number.

4.4.18.1.1.7 Additional material shall be permitted to be inserted following the Transmission Identification subject to agreement between the Authorities responsible for the operation of the circuit. Such additional material shall be preceded by a SPACE (→) and shall not contain any Alignment Functions. When no such additional material is added the information in 4.4.18.1.1.6 shall be followed immediately by that of 4.4.18.1.2.

4.4.18.1.1.8 RECOMMENDATION.— *To avoid any misinterpretation of the Diversion Indicator the sequence of two consecutive characters V (5/6) should not appear in any component of the heading line.*

4.4.18.1.2 The Line-following-the Heading line shall comprise:

a) Alignment Function (≺ ≡)

b) Priority Indicator

c) Adressee Indicator(s)

d) Alignment Function (≺ ≡).

4.4.18.1.2.1 The Priority Indicator shall consist of the appropriate 2-letter group assigned by the originator in accordance with the following:

Priority Indicator	*Message Category*
SS	Distress messages, distress traffic and urgency messages (*see* 4.4.1.1.1, 4.4.1.1.2)
DD	Messages justifying the requirement for special priority handling (*see* 4.4.1.2.3, 4.4.1.2.3.1)
FF (or GG)	Flight Safety Messages (*see* 4.4.1.1.3)
GG (or JJ)	Meteorological messages (*see* 4.4.1.1.4)
GG (or JJ)	Flight regularity messages (*see* 4.4.1.1.5)
JJ	Aeronautical administrative messages (*see* 4.4.1.1.6)
GG (or JJ)	NOTAM – Class I distribution messages (*see* 4.4.1.1.7)
KK	Reservation messages (*see* 4.4.1.1.8)
as appropriate	Service messages (*see* 4.4.1.1.10)
LL	General aircraft operating agency messages (*see* 4.4.1.1.9).

MESSAGE FORMAT

5-UNIT CODED CHARACTER SET

Note 1 – The following illustrates the teletypewriter message format described in 4.4.18.1 to 4.4.18.3.

Message Part		*Component of the Message Part*	*Elements of the Component*	*Teletypewriter Character*
THE HEADING	HEADING LINE (see 4.4.18.1.1)	Start-of-Heading Character	One Character (0/1)	SOH
		Transmission Identification	a) Transmitting-terminal letter b) Receiving-terminal letter c) Channel-identification letter d) Channel-sequence number *(Example: NRA062)*	
		(If necessary) Additional Service Indication	a) One SPACE b) No more than the remainder of the line *(Example: 270930)*	–
		DIVERSION INDICATOR *(if necessary, see 4.4.18.6)*	The Procedure Signal VVV	VVV
	SHORTENED ADDRESS (see 4.4.9.1)	At this position in a message one or more Shortened Addresses may appear whenever it is necessary to take specific action to preclude the possibility of the next relay station making a redundant transmission that could give rise to double or multiple delivery of the message to one or more addressees (see 4.4.9.1)		≪ ≡
	ADDRESS (see 4.4.18.1.2)	Alignment Function	Two CARRIAGE RETURNS, one LINE FEED	≪ ≡
		Priority Indicator	The relevant 2-letter group	
		Addressee Indicator(s)	One SPACE A 6- or 8-letter group } given in sequence for each addressee *(Example: → FGLLZR → FGLLYK → FGLLPARD)*	
		Alignment Function	Two CARRIAGE RETURNS, one LINE FEED	≪ ≡
	ORIGIN (see 4.4.18.1.3)	Filing Time	6-digit date-time group specifying when the message was filed for transmission	
		Originator Indicator	a) One SPACE b) 6- or 8-letter group identifying the message originator	–
		Priority Alarm *(used only in teletypewriter operation for Distress Traffic and Urgency Messages)*	Five characters (0/7) (BEL)	
		Optional Heading Information	Additional data not to exceed the remainder of the line. *See* 4.4.18.1.3.7.	
		Alignment Function	Two CARRIAGE RETURNS, one LINE FEED	≪ ≡
		Start-of-Text Character	One character (0/2)	STX
	TEXT (see 4.4.18.2)	Beginning of the Text	Specific identification of Addressee(s) *(if necessary)* *with* each followed by two CARRIAGE RETURNS, one LINE FEED *(if necessary)* The English word FROM *(if necessary)* (see 4.4.18.2.4) Specific identification of Originator *(if necessary)* The English word STOP followed by two CARRIAGE RETURNS, one LINE FEED *(if necessary)* (see 4.4.18.2.5) *and/or* Originator's reference *(if used)*	
		Message Text	Message Text with two CARRIAGE RETURNS, one LINE FEED at the end of each printed line of the Text except for the last one (see 4.4.18.2.6)	
		Confirmation *(if necessary)*	a) Two CARRIAGE RETURNS, one LINE FEED b) The abbreviation CFM followed by that portion of the Text being confirmed.	
		Correction *(if necessary)*	a) Two CARRIAGE RETURNS, one LINE FEED b) The abbreviation COR followed by the correction of an error made in the preceding Text	
	ENDING (See 4.4.18.2.12)	Alignment Function	Two CARRIAGE RETURNS, one LINE FEED	≪ ≡
		Page feed Sequence	One character (0/11)	VT
		End-of-Text character	One character (0/3)	ETX

4.4.18.1.2.2 The order of priority shall be the same as specified in 4.4.1.2.

4.4.18.1.2.3 Except as provided in 4.4.18.1.2.3.1, 4.4.18.1.2.3.2, 4.4.18.1.2.3.3 and 4.4.17, an Addressee Indicator shall comprise the Location Indicator of the place of destination followed immediately by the ICAO 2-letter designator identifying the Organization (Aeronautical Authority, Service or Aircraft Operating Agency) addressed. The Addressee Indicator shall be immediately preceded by a SPACE (—).

4.4.18.1.2.3.1 Except when the provisions of 4.4.18.1.2.3.2, 4.4.18.1.2.3.3 or 4.4.17 are applied, the Originator of a message shall be permitted to add immediately following the last letter of the 6-letter indicator prescribed in 4.4.18.1.2.3 a 2-letter group, representing a department or division of the Organization addressed, in instances where such a 2-letter group will facilitate the internal distribution of the message within that organization addressed.

4.4.18.1.2.3.2 Where a message is to be addressed to an organization that has not been allocated an ICAO 2-letter designator of the type prescribed in 4.4.18.1.2.3 the Location Indicator of the place of destination shall be followed by the ICAO 2-letter designator YY for the ICAO 2-letter designator YX in the case of Military Service/Organization). The name of the addressee Organization shall then be included in the first item in the Text of the message. No seventh or eighth position letters shall follow the ICAO 2-letter designator YX or YY.

4.4.18.1.2.3.3 Where a message is to be addressed to an aircraft in flight and, therefore, requires handling over the AFTN for part of its routing before retransmission over the Aeronautical Mobile Service, the Location Indicator of the aeronautical station which is to relay the message to the aircraft shall be followed by the ICAO 2-letter designator ZZ. The identification of the aircraft shall then be included in the first item of the Text of the message. No seventh or eighth position letters shall follow the ICAO 2-letter designator ZZ.

4.4.18.1.2.4 The complete address shall be restricted to a single line of page-printing copy, and, except as provided in 4.4.17, a separate (6 or 8 letter) Addressee Indicator shall be used for each addressee whether at the same or different locations.

4.4.18.1.2.5 The completion of the Addressee Indicator group(s) in the address of a message shall be immediately followed by the Alignment Function.

4.4.18.1.3 *Origin Line*

The Origin Line shall comprise:

a) Filing Time

b) Originator Indicator

c) Priority Alarm (when necessary)

d) Optional Data Field

e) Alignment Function (≮ ≡).

4.4.18.1.3.1 The filing time shall comprise the 6-digit date-time group indicating the date and time of filing the message for transmission (*see* 3.4.2).

4.4.18.1.3.2 Except as provided in 4.4.18.1.3.3, 4.4.18.1.3.4 and/or 4.4.18.1.3.5 the Originator Indicator shall comprise the Location Indicator of the place at which the message is originated, followed immediately by the ICAO 2-letter designator identifying the Organization (Aeronautical Authority, Service or Aircraft Operating Agency) which originated the message. The Originator Indicator shall be immediately preceded by a SPACE (—).

4.4.18.1.3.3 Except when the provisions of 4.4.18.1.3.4 or 4.4.18.1.3.5 are applied, the Originator of a message shall be permitted to add, immediately following the last letter of the 6-letter Originator Indicator prescribed in 4.4.18.1.3.2 a 2-letter group representing the department or division of the Organization originating the message, in instances where such addition will facilitate the interpretation of the message by the Addressee.

4.4.18.1.3.4 Where a message is originated by an Organization that has not been allocated an ICAO 2-letter designator of the type prescribed in 4.4.18.1.3.2 the Location Indicator of the place at which the message is originated shall be followed immediately by the ICAO 2-letter designator YY or the ICAO 2-letter designator YX in the case of a Military Service or Organization. The name of the Organization (or Military Service) shall then be included in the first item in the Text of the message.

4.4.18.1.3.5 Where a message originated by an aircraft in flight requires handling on the AFTN for part of its routing before delivery, the Originator Indicator shall comprise the Location Indicator of the aeronautical station responsible for transferring the message to the AFTN, followed immediately by the ICAO 2-letter designator ZZ. The identification of the aircraft shall then be included in the first item in the Text of the message.

4.4.18.1.3.6 The priority alarm shall be used only for distress messages, distress traffic and urgency messages. When used it shall consist of five successive BLL (0/7) characters.

Note.—Use of the Priority Alarm will actuate a bell (attention) signal at the receiving teletypewriter station, other than at those fully automatic stations which may provide a similar alarm on receipt of Priority Indicator SS, thereby alerting supervisory personnel at relay centres and operators at tributary stations, so that immediate attention may be given to the message.

4.4.18.1.3.7 The inclusion of optional data in the Origin Line shall be permitted provided a total of 69 characters is not exceeded and subject to agreement between the Administrations concerned.

4.4.18.1.3.8 The Origin Line shall be concluded by an Alignment Function (≮ ≡) and the Start-of-Text (STX) (0/2) character.

4.4.18.2 *Text*

4.4.18.2.1 The Text of messages shall be drafted in accordance with 4.1.2 and shall consist of all data between STX and ETX.

Note.—When message texts do not require conversion to the ITA-2 code and format and do not conflict with ICAO message types or formats in PANS-RAC (Doc 4444-RAC/501), Administrations may make full use of the characters available in the 7-unit coded character set.

4.4.18.2.2 When an Originator's reference is used, it shall appear at the beginning of the Text, except as provided in 4.4.18.2.3 and 4.4.18.2.4.

4.4.18.2.3 When the ICAO 2-letter designators YX, YY or ZZ comprise the second element of the Addressee Indicator (see 4.4.18.1.2.2.2 and 4.4.18.1.2.3.3) and it, therefore, becomes necessary to identify in the Text the specific addressee of the message, such identification group shall precede the originator's reference (if used) and become the first item of the Text.

4.4.18.2.4 When the ICAO 2-letter designators YX, YY or ZZ comprise the second element of the Originator Indicator (see 4.4.18.1.3.4 and 4.4.18.1.3.5) and it thus becomes necessary to identify in the Text the name of the Organization for Military Services or the aircraft which originated the message, such identification shall be inserted in the first item of the Text of the message.

4.4.18.2.5 When applying the provisions of 4.4.18.2.3 and 4.4.18.2.4 to messages where the ICAO 2-letter designator(s) YX, YY, ZZ refer to two or more different Organizations (or Military Services), the sequence of further identification in the Text shall correspond to the complete sequence used in the Address and Originator Indicator of the message. In such instance, each Addressee identification shall be followed immediately by an Alignment Function. The name of the (YX, YY or ZZ) Organization originating the message shall then be preceded with "FROM" "STOP" followed by an Alignment Function shall then be included in the Text at the end of this identification and preceding the remainder of text.

4.4.18.2.6 An Alignment Function shall be transmitted at the end of each printed line of the Text. Except as provided in 4.4.16.1.1 *b)* when it is desired to confirm a portion of the Text of a message in teletypewriter operation, such confirmation shall be separated from the last Text group by an Alignment Function (≪ ≡), and shall be indicated by the abbreviation CFM followed by the portion being confirmed.

4.4.18.2.7 Where messages are prepared off-line, e.g. by preparation of a paper tape, errors in the text shall be corrected by backspacing and replacing the character in error by character DEL (7/15).

4.4.18.2.8 Except when the provisions of 4.4.16.1.1 *a)* apply, corrections to textual errors made in on-line operations shall be corrected by inserting — E — E — E — following the error, then retyping the last correct word (or group).

4.4.18.2.9 Except as provided in 4.4.16.1.1 *b)* when it is not discovered until later in the origination process that an error has been made in the text, the correction shall be separated from the last Text group (or confirmation, if any, by an Alignment Function (≪ ≡). This shall be followed by the abbreviation COR and the correction.

4.4.18.2.10 Stations shall make all indicated corrections on the page-copy prior to local delivery or a transfer to a manually operated circuit.

4.4.18.2.11 The Text of AFTN messages shall not exceed 1 200 characters in length. AFTN messages exceeding 1 200 characters shall be filed in the form of separate messages. When messages or data are transmitted only on medium or high speed circuits, the text may be increased to a value that does not exceed 7 000 characters for all components of the message as long as performance characteristics of the network or link are not diminished and subject to agreement between the administrations concerned.

4.4.18.2.12 The Ending of a message shall comprise the following in the order stated:

a) An Alignment (≪ ≡) Function following the last line of text;

b) Vertical Tab (VT), Character 0/11

c) End of Text (ETX), Character 0/3

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APPENDIX VIII

80. COLLECTIVE BREAKDOWN SPECIFIC PROCEDURES

The WMSCR shall perform the procedures defined in the paragraphs below for each of the product types requiring collective breakdown and report storage. In addition, procedures to be used for the special handling of specified products are also described. This special handling entails interpretation or alteration of the product identification. This may require limited access to information beyond the WMO header.

The following statements apply to the sections of this appendix:

a. Unless otherwise stated, all references to date time refer to the date time field in the format ddhhmm. The date time field may be referenced in the WMO header or internally in the received product.

b. Unless otherwise stated, references to report separator refer to hexadecimal representation 1E (Hex 1E).

c. A "version" is defined as the product/report modifier plus the count (e.g., AMD 1). If it is indicated that the "version" may be contained as a field in the data format or WMO header, the count portion of the version may or may not be present. In the event two modifiers or a modifier and a version are contained in the same product/report (e.g., COR AMD or COR AMD 1), the first modifier or version shall be used in construction of the URI.

d. Some of the data elements, of the data formats described in this appendix, are encased in parentheses { }. This indicates that the data element may or may not be contained in the received data.

e. For reports which have the report time rounded off to the hour (e.g., SAs), the observation time reported will remain as part of the report. For example, if a SA with an observation time of 1256 were received, the URI would contain a observation time of 1300, but the time of 1256 would be retained in the report proper. References in this appendix for using the observation time for construction of the URI are valid, but may be modified as described above if rounding of the time is appropriate for a report.

f. Due to local polling procedures, observational reports in collectives sometimes contain no data. That is, the station identifier is

present, but no report follows. When such cases are encountered during collective breakdown, no further attempt shall be made to retain the report in the WMSCR data base. If any information follows the station identifier (e.g., DLAD, FINO, PINO), the report will be retained in the WMSCR data base using the necessary information from the WMO header to construct the URI. The specific data types where such instances may be encountered are identified in appropriate sections of this appendix by identifying the report text as {report_text} in the report format description.

80.1 Domestic hourly observations (SA). WMSCR shall receive and store hourly weather observations from manual and automatic weather reporting sites that include the SAS, ADAS, airlines, KAWN, and the NWSTG. Domestic hourly observations also include reports from both Canada and Mexico. These observations will normally be received as products, containing one or more reports, which have been designated for collective breakdown. Each domestic SA report shall be catalogued to the SIDB entry corresponding to the reporting station.

Individual reports will usually be in the format shown below.

SSS {data_type} {modifier} {ob_time} {report_text} report_separator

Each report begins with a three-character station identifier (SSS) and ends with a report separator character. The data type identifier SA, SP, USP, RS, URS, or SW will normally follow the station identifier. The data type field may not be present and the data type shall then be obtained from the product WMO header. The modifier field, "COR" (corrected report) or "RTD" (retarded/delayed report), may follow the data type indicator. The next field will normally be the observation time in the format hhmm. Some automated stations do not include the observation time in the report and in those instances, the observation time shall be obtained from the product WMO header. The automated station designator AMOS, RAMOS, AUTOB, AUTO1, and AUTO2 are considered part of the report text.

The station identifier, date (from the WMO header), observation time (from the report, or if missing, the WMO header), data type (from the report, or if missing, the WMO header), and modifier (from the report) shall be used to construct the URI.

80.2 Military hourly observations (SA). WMSCR shall receive and store military SAs received from Carswell Air Force Base (KAWN). These products generally will have the same format as civilian SAs. However, some military collectives routinely do not include either data type or observation time in the reports. As with the domestic SAs, this information shall be obtained from the WMO header. Breakdown procedures for military hourly observations are the same as described for domestic hourly observations.

80.3 International hourly observations (SA). WMSCR shall receive and store international airport surface observations. International SA reports shall be catalogued to SIDB entries corresponding to international locations (including selected domestic locations). These reports conform to the METAR format defined in WMO publication 306 (FM 15.V) and are contained in collectives received from the NWSTG and KAWN. Each individual report begins with a four-character airport identifier (SSSS) and ends with a report separator. METAR reports have the following format:

{METAR} {ob_time} SSSS {report_text} report_separator

Following the WMO header, a sequence of reports begins with the word "METAR" followed by an observation time (ob_time) in the format hhmm. All subsequent reports are assumed to have the same time. The word METAR will normally not be repeated and the observation time will not be repeated on subsequent reports unless it varies from the observation time of the first report.

The station identifier, date (from the WMO header) observation time (from the report, or if missing, from the first report in the collective), data type (from the WMO header), and modifier (from WMO header) shall be used to construct the URI for each report.

80.4 Domestic terminal forecasts (FT). WMSCR shall receive and store domestic terminal forecasts. Domestic FTs are prepared at the Weather Service Field Offices (WSFO) and are relayed to the WMSCR via the NWSTG link as collectives. Terminal forecasts shall be catalogued to an SIDB entry corresponding to domestic, Canadian, or Mexican location. Each report will begin with a three-character station identifier (SSS) and end with a report separator. The terminal forecast reports have the format:

SSS data_type {version} valid_period report_text report_separator

Following the station identifier will be the data type "FT" and, if applicable, the version. The last field to be identified is the valid period field. The valid period will be in the form ddhhhh where dd is the date and hhhh is the beginning and ending hours for the forecast (e.g., 271815 indicates that the valid time begins on the 27th of the month at 1800Z and ends at 1500Z on the following day). The valid time is the first hh encountered in the valid period. To determine the valid time for construction of the URI, "00" is appended to the first two digits of the hhhh field. For a valid period of 271815, the valid time would be "1800" hours.

The station identifier, data type (from the WMO header), version (from the report), date (from the valid period field), and valid time (computed from the valid period), shall be used to construct the URI. In the event there are two modifiers in the report (e.g., COR AMD 1), the first modifier shall be used for construction of the URI.

80.5 Military terminal forecasts (FT). WMSCR shall receive and store military terminal forecasts which are received from KAWN. Military terminal forecast formats and procedures are identical to those for international terminal forecasts (paragraph 80.6).

80.6 International terminal forecasts (FT). WMSCR shall receive and store international terminal forecasts. These reports are received as collectives from the NWSTG, KAWN, and AFTN. International terminal forecasts shall be catalogued to SIDB entries corresponding to international identifier locations. International terminal forecasts are formatted in accordance with the TAF format defined in WMO publication 306 (FM 51-V). International FTs will be contained within WMO products in the following format:

{TAF} {version} SSSS valid_period report_text report_separator

Following the WMO header, a sequence of reports begins with the word "TAF" which may or may not be repeated for each report. The next field will be the version, if applicable. This will be followed by a four-character station identifier (SSSS) and a four-digit valid period field (hhhh). The valid period contains the hours for which the forecast is valid. The first hh encountered identifies the valid start time. For example, 1310 would indicate the forecast is valid from 1300Z until 1000Z the following day and the valid time for construction of the URI would be obtained by appending "00" to the valid period start hour (e.g., 13 + 00 results in a valid time of 1300).

The station identifier, version (from the report), date (from the WMO header), valid time (computed from the valid period), and data type (from WMO header) shall be used to construct the URI for each report.

80.7 Wind and temperature aloft forecasts (FD). WMSCR shall receive and store wind and temperature aloft forecasts received from the NWSTG. FD reports shall be catalogued to SIDB entries corresponding to domestic station identifiers. These reports will be received as WMO formatted collectives and are issued as two distinct products, one covering 3,000 ft above ground level (AGL) to 39,000 ft AGL and the other covering 45,000 ft AGL to 53,000 ft AGL. The products will have unique WMO headers to differentiate between them.

Following the WMO header, but preceding the reports, will be three report header lines that define the forecast based on time, the valid date time, and identification of the data columns. Following is an example of the three internal header lines of the FD collectives:

```
DATA BASED on 181200Z
VALID 181800Z FOR USE 1700-2100Z.  TEMPS NEG ABV 24000.
FT    3000  6000  9000  12000  18000  24000  30000  34000  39000
```

The first header line will have a report separator preceding the word "DATA". The first and third of these header lines may be ignored for purposes of construction of the URI. The third header line (column headings) may not be included in some of the transmitted FDs. In the second header line, the valid date time field consists of the first six digits following the word "VALID" in the format ddhhmm.

Each report will begin with a three-character station identifier (SSS) and end with a report separator. FD reports within the collective have the following format:

SSS report_text report separator

The data type shall be obtained by combining the first two and the last two characters (sometimes one character) of the WMO header (e.g., FD8, FD10, FD16).

The station identifier, data type (from the WMO header), valid date time (from the second internal header line), and the version (from WMO header) shall be used to construct the URI. All internal header lines received shall be retained with each report stored in the WMSCR reports data base.

80.8 Area forecasts (FA). The WMSCR shall receive and store area forecasts

issued by the National Weather Advisory Unit located in Kansas City. Alaska and Hawaii FAs are issued from their respective WSFOs. All FAs are received from the NWSTG.

Area forecasts are issued for ten geographic areas associated with WSFO identifiers: ANC, BOS, CHI, DFW, FAI, HNL, JNU, MIA, SFO, SLC.

Each area forecast is divided in five sections:

a. H = 1 = Hazards/flight precautions.
b. I = 2 = Icing and freezing levels.
c. S = 3 = Synopsis.
d. T = 4 = Turbulence.
e. C = 5 = Significant clouds and weather.

Each section is issued as a separate product three times per day for each WSFO area. Following the WMO header is an internal header line, formatted as follows:

SSSs data_type date_time

This header begins with the WSFO area identifier (SSS) to which with the section identification (s), one of the five section letters defined above (i.e., H, I, S, T, or C), is added. This is followed by the data type "FA" and the internal date time field. The following is an example of a FA:

FAUS6 KBOS 180840
BOSH FA 180840
product_text

The WMSCR shall perform special report storage procedures for FA reports. Each FA product shall be stored in the report data base in two ways:

a. First, to satisfy the existing RQ capabilities, each product shall be catalogued to an SIDB entry for a pseudo station whose identifier is a combination of the WSFO identification and the FA section letter (e.g., BOSH (hazards), SLCC (clouds)). The WSFO identification including the section letter (i.e., SSSs), data type (from the internal header line), version (from WMO header), and date time (from the internal header line) shall be used to construct the URI.

b. Second, each product shall be catalogued to the actual station name (BOS, CHI, etc.) with the data type field being set to FA1 through FA5, where the added digit corresponds to the section identification numbering scheme defined above. The WSFO identifier (SSS), data type (FA1 through FA5), version (from WMO header) and date time (from the internal header line) shall be used to construct the URI.

80.9 Pilot reports (UA). The WMSCR shall receive and store pilot reports received from flight service stations and other enroute facilities. UA shall

be catalogued to SIDB entries corresponding to domestic locations. Pilot reports can be received as individual reports or as collectives. Data received in the WMO format will contain one or more observations and shall require breakdown. Each report will begin with a three-character station identifier (SSS) and end with a report separator. Reports will generally be received in one of the two formats shown below.

SSS data_type /OV SSS {D-R} {/TM} ob_time report_text report_separator

or

SSS data_type
data_type /OV SSS {D-R} {/TM} ob_time report_text report_separator

Following the station identifier (SSS) will be the data type (UA or UUA) and the construct /OV, which will be followed by the same or a different station identifier (SSS). The optional fields D-R (direction and range) is represented as dddrrr consisting of 6 numerics and the construct /TM (time) is followed by the observation time (ob time) in hours and minutes (hhmm). In some instances, the second SSS and D-R will not be separated by a space (e.g., ALB185018).

The first station identifier, observation time, modifier (from the WMO header), and data type (from the report) shall be used to construct the URI.

80.10 Severe weather forecasts (WW). The WMSCR shall receive and store severe weather forecasts. WWs are prepared by the NSSFC in Kansas City and sent directly to the WMSCR. WWs shall be catalogued to the SIDB entry corresponding to Kansas City (MKC).

The station identifier (MKC), data type (from the WMO header), version (from WMO header), and date time (from the WMO header) shall be used to construct the URI.

80.11 Flight advisories (SIGMETS WS). The WMSCR shall receive and store SIGMETS that are received from the NSSFC in Kansas City and, for Alaska and Hawaii, from the NWSTG. SIGMETS are identified by the WMO header followed by the WSFO identifier of the applicable area (BOS, CHI, ANC, DFW, FAI, HNL, JNU, MIA, SFO, and SLC). Following the WMO header of a SIGMET is the internal header line which is in the format:

SSSx data_type date_time
product_text

The SIGMET internal header line begins with the WSFO identifier (SSS) in concatenation with SIGMET designator (x), a letter A through N. This is followed by the data type (WS or UWS) and date time. The following is an example of a SIGMET:

WSUS1 KSLC 270830 {version}
SLCB WS 270830
product_text

The WSFO identifier, together with the SIGMENT designator (e.g., SLCB), data type (from the internal header line), version (from the WMO header), and date

time (from the internal header) shall be used to construct the URI.

80.12 Convective SIGMETS (WST). The WMSCR shall receive and store convective SIGMETS that are received from the NSSFC in Kansas City and, for Alaska and Hawaii, from the NWSTG. Convective SIGMETS are identified by the WMO header followed by the WSFO identifier of the applicable area (BOS, CHI, ANC, DWF, FAI, HNL, JNU, MIA, SFO, and SLC. Following the WMO header, convective SIGMETs are assigned a geographical area (East, Central, or West). Following the WMO header of a convective SIGMET is the internal header line which is in the format:

SSSy data_type date_time {version}
product_text

The convective SIGMET internal header begins with the station identifier (MKC) in concatenation with the area identifier (y) where (y = E, C, or W). This is followed by the data type (WST) and the date time. Special WSTs may be issued, however, they contain no unique identification in the WMO or internal headers and are processed as any other incoming convective SIGMET. The following is an example of a convective SIGMET:

WSUS40 271355 {version}
MKCE WST 271355
CONVECTIVE SIGMET 25E

Convective SIGMETs shall be stored as a report using the station and geographical area identifiers (e.g., MKCE), data type (from the internal header), version (from the WMO header), and date time (from the internal header) shall be used to construct the URI.

80.13 AIRMETS (WA). The WMSCR shall receive and store AIRMETs that are received from the NSSFC in Kansas City and, for Alaska and Hawaii, from the NWSTG. AIRMETs are identified by the WMO header followed by the WSFO identifier of the applicable area (BOS, CHI, ANC, DFW, FAI, HNL, JNU, MIA, SFO, and SLC). Following the WMO header of an AIRMET is the internal header line which is in the format:

SSSz data_type date_time
product_text

The AIRMET internal header begins with the WSFO identifier (SSS) in concatenation with the AIRMET designator (z), a letter O through Z. This is followed by the data type (WA or UWA), and the date time. The following is an example of an AIRMET:

WAUS1 KBOS 111710 {version}
BOSO WA 111710
product_text

AIRMETS shall be stored as a report using the WSFO and AIRMET designator (e.g., BOSO), data type (WA or UWA from the internal header), version (from the WMO header), and date time (from the internal header to construct the URI.

80.14 Radar reports (SD). The WMSCR shall receive and store radar weather

reports. SD messages are received hourly from the NWSTG as collectives with a WMO header. Each report begins with a station identifier and ends with a report separator. WMSCR shall catalog SD reports to the SIDB entry associated with the location identifier. SD reports will be formatted as follows:

SSS {report_text} report_separator

The station identifier, data type (from the WMO header), modifier (from the WMO header), and date time (from the WMO header) shall be used to construct the URI.

80.15 Transcribed weather broadcasts (TWEB, SYNS). The WMSCR shall receive and store TWEB and SYNS (Synopsis) reports. TWEBs and SYNSs are prepared at the WSFOs and are forwarded to WMSCR over the NWSTG interface three times per day as collectives. Within each product are multiple TWEBs and normally one SYNS. A SYNS is associated with a reporting station (SSS). A TWEB is identified by a route number (nnn). Reports are separated by a report separator. The format of SYNS/TWEB reports are as follows:

SSS SYNS {version} date_time SYNS_text report_separator

nnn TWEB {version} date_time TWEB_text report_separator

The SYNS reports shall be catalogued to the SIDB entry associated with the station (SSS). The TWEBs reports shall be catalogued to an SIDB entry associated with pseudo-stations consisting of the route number (nnn) (e.g., 001, 002, etc.).

The station identification (SSS) or route number (nnn), data type (SYNS or TWEB), date time (from the report), and version (from the report) shall be used to construct the URI for each report.

80.16 WMO surface observations (SM, SI, SN). The WMSCR shall receive and store WMO SYNOPTIC surface observations. These reports are received from the NWSTG and shall be catalogued to SIDB entries corresponding to international and domestic WMO observing sites. SM, SI, and SN reports conform to the WMO SYNOPTIC observation format defined in WMO publication 306 (FM 11-V). Following the WMO header, the SYNOPTIC surface reports have the format:

{AAXX} {date_time_w}
IIIII {report_text} report_separator

Each SYNOPTIC collective may have an internal header line containing the key word "AAXX" followed by a date hour wind indicator field (ddhhw), composed of the date (dd) and the hour of the day (hh); the wind indicator (w) can be ignored. The AAXX field may be present without the date_hour_w field, but the reverse is not true.

Each report begins with a five-digit observing site identifier (IIIII) and ends with a report separator. The station identifier, the data type (from the WMO header), the date time (from the internal header, if present, otherwise the WMO header), and modifier (from the WMO header) shall be used to construct the URI for each report. In constructing the time field for the URI, the minutes (mm) will be set to 00 if they do not already have that value.

80.17 WMO upper air observations (TEMP and PILOT). The WMSCR shall receive and store upper air reports which are received in WMO formatted collectives. These reports are received from the NWSTG and shall catalogued to SIDB entries corresponding to international and domestic WMO observing sites. TEMP and PILOT reports conform to the WMO synoptic observation format defined in WMO publication 306 (FM 32-V and FM 33-V). Upper air reports are unique from other weather collectives, in that, different data types may be contained under a WMO header. Reports are separated by a report separator. Upper air reports have the following format:

{IIIII} data_type ddhhw IIIII {report_text} report_separator

Following the WMO header, a report may begin with a five-digit station identifier (IIIII - which can be ignored), or with the data type. Data types for radiosonde data are TTAA, TTBB, TTCC, and TTDD. For upper air wind data, the data types are PPAA, PPBB, PPCC,and PPDD. The date hour field (GGYYx) is composed of the date (GG), the hour of the day (YY), and the wind indicator (w), the latter can be ignored. If GG is greater than 50, 50 shall be subtracted from the value to obtain the correct date. The time (YY) is in whole hours GMT (e.g., 12, 13, 14, etc.) and minutes of "00" shall be appended to obtain the time for the URI. The five-digit station identifier (IIIII) follows.

The station identifier (from the report), data type (from the report), date time (from the report), and modifier (from WMO header) shall be used to construct the URI.

80.18 Operational forecasts (FO). The WMSCR shall receive and store operational forecasts received from the NWSTG. These reports will be received in collectives and shall be catalogued to SIDB entries corresponding to domestic locations. FOs contain a variety of computer-calculated weather parameters for each station site contained in the collective. The FOs are received in two different data formats, FOUS12 and FOUS22. However, for purposes of collective breakdown, the identification fields are identical and are in the following format:

SSS product_text report separator

The following are examples of FO collectives:

```
FOUS12 KWBC 181849 {version}
DCA  E
16_lines_product_text report_separator

FOUS22 KWBC 181850 {version}
DCA 3_lines_product_text report_separator
```

Each report will begin with a three-character station identifier followed by the product text and report separator.

The station identifier, data type (from the WMO header), version (from the WMO header), and date time (from the WMO header) shall be used to construct the URI. The data type is obtained from the first two and last two characters of the first word of the WMO header. The FO examples shown above would have

data types of FO12 and FO22, respectively.

80.19 Public forecasts (FP). The WMSCR shall receive and store public area forecasts. Public forecasts are issued by the WSFOs for specific geographical areas associated with selected locations. They are received from the NWSTG. FPs shall be catalogued to an SIDB entry associated with the station location whose identification (less the leading K) appears in the origin field of the WMO header, data type (from the WMO header), date time (from the WMO header) shall be used to construct the URI. For example, the product FPUS21 KDEN would be catalogued to the DEN station entry as a FP data type.

APPENDIX IX

90. ELECTROMAGNETIC INTERFERENCE REQUIREMENTS

The WMSCR equipment shall meet the following MIL-STD-461 requirements of Parts 1 and 7 when tested to MIL-STD-462. Modifications to MIL-STD-461 are also described below. An EMI test shall be conducted by the contractor.

90.1 CE01 and CE03, Conducted emissions, power and interconnecting leads, 30 Hz to 15 KHz and 0.015 to 50 MHz, narrowband and broadband. See Figures 90-1, 90-2, 90-3, and 90-4 for modifications.

90.2 CS01, Conducted susceptibility, power leads, 30 Hz to 50 kHz. See Figure 90-5 for modifications. The frequency range within 10% of the rated power frequency shall be omitted.

90.3 CS02, Conducted susceptibility, power leads, 0.05 to 400 MHz. The limit is 1 V rms over the frequency range.

90.4 CS06, Conducted susceptibility, spikes, power leads. The modified wave shape and limit are shown in Figure 90-6. Either the series or the shunt method may be used. Pulses may be manually actuated at any rate for a total of 20 pulses minimum.

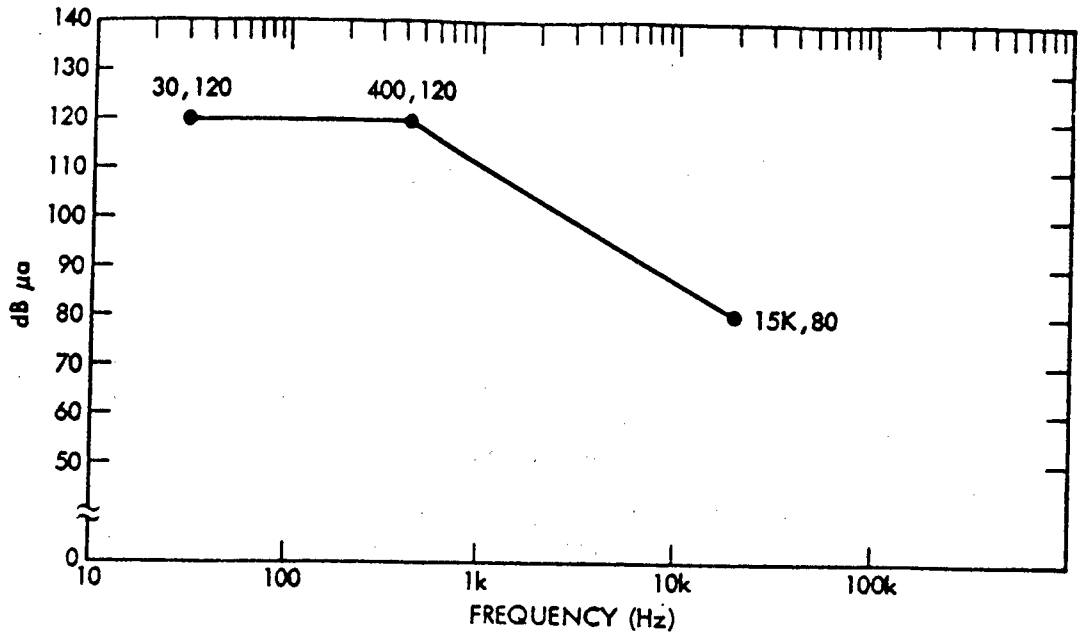

Figure 90-1. Limit for CE01 Narrowband Emissions

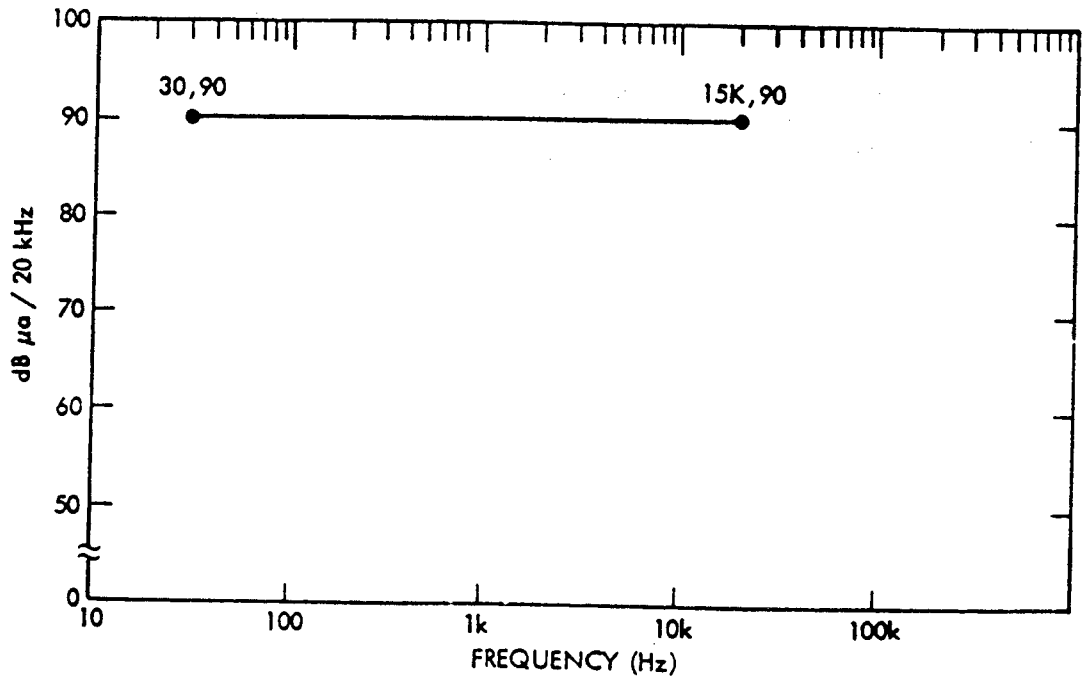

Figure 90-2. Limit for CE01 Broadband Emissions

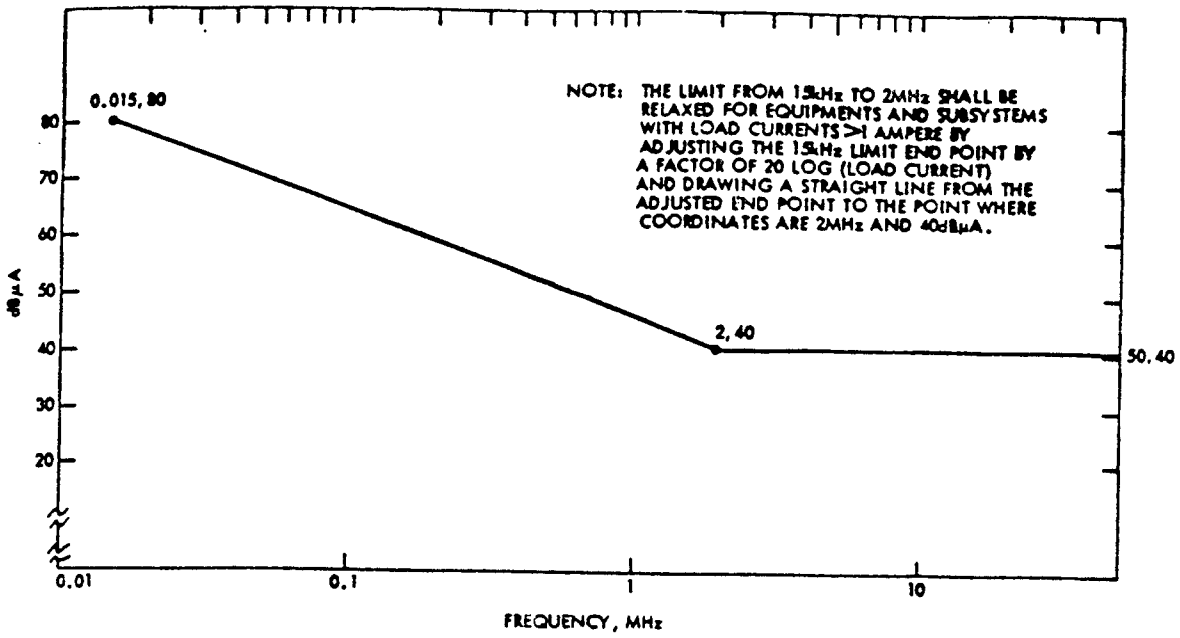

Figure 90-3. Limit for CE03 Narrowband Emissions
ac, dc and Interconnect Leads

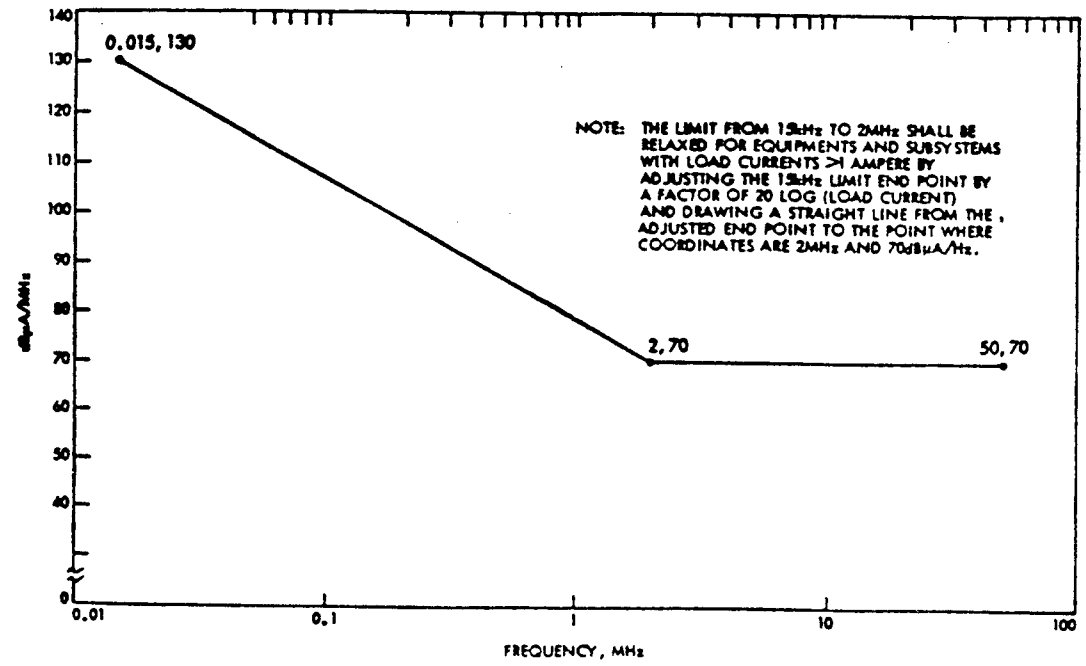

Figure 90-4. Limit for CE03 Broadband Emisssions
ac. dc and Interconnection Leads

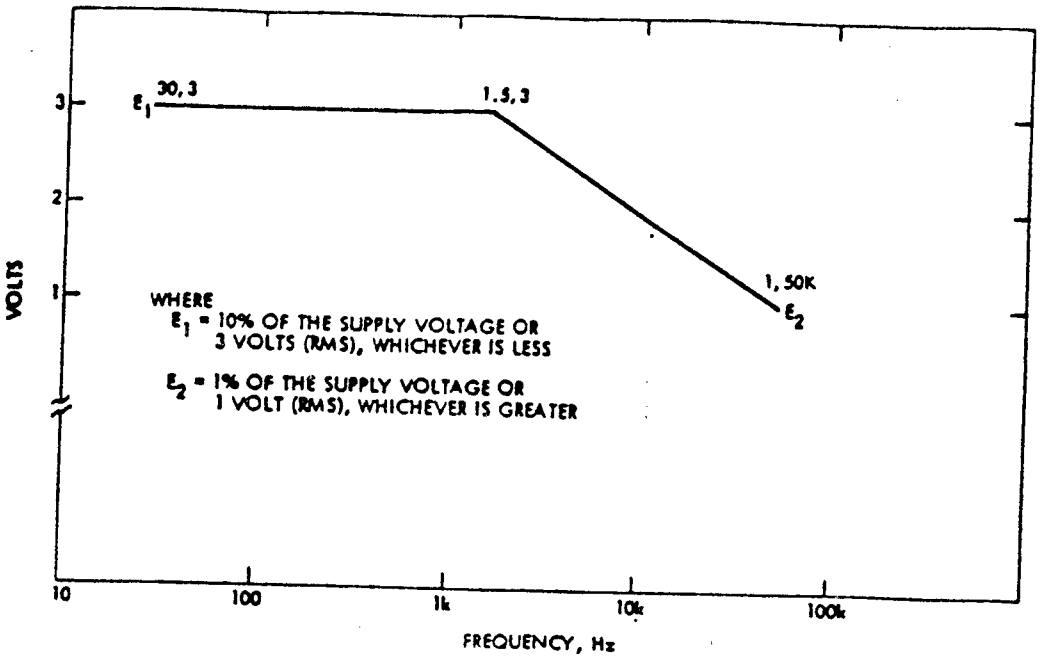

Figure 90-5. Limit for CS01

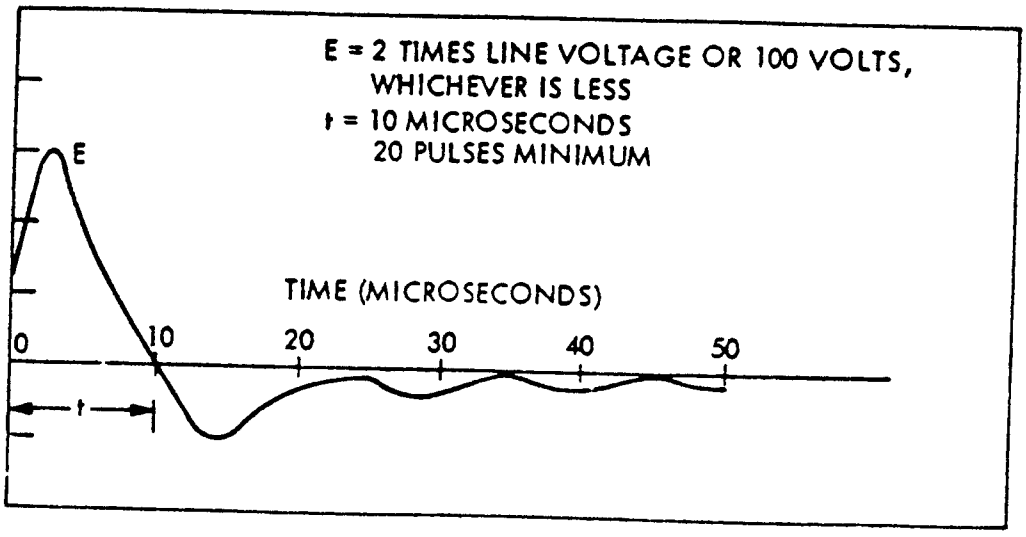

Figure 90-6. Limit for CS06

90.5 RE02, Radiated emissions, electric field, 14 kHz to 10 GHz narrowband and broadband.- See Figures 90-7 and 90-8 for modifications. The upper limit of the narrowbvand test (Figure 90-7) is 1 GHz if no clock pulse rate exceeds 200 mpps. Any equipment with clock pulse rates exceeding 200 mpps shall be tested to 10 GHz.

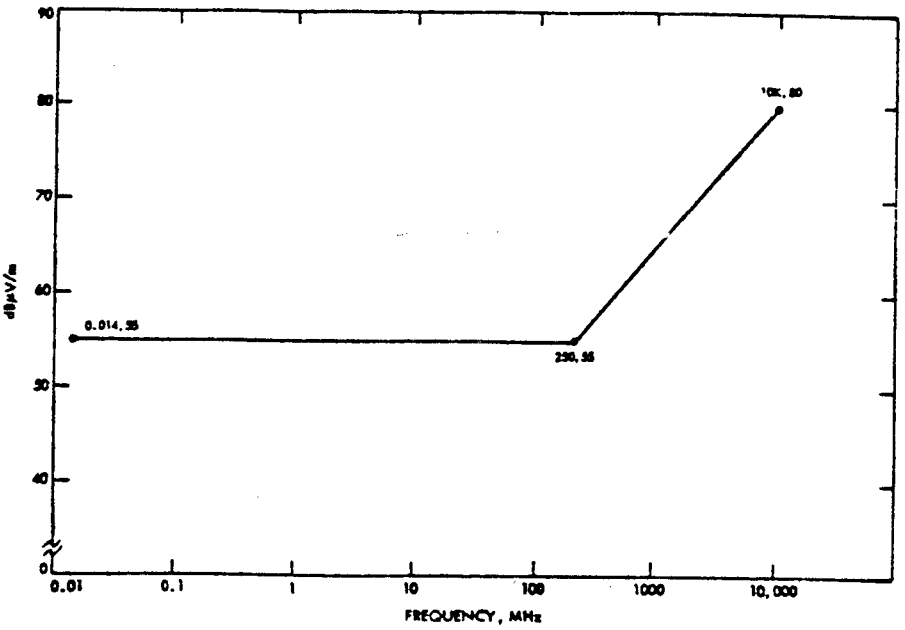

Figure 90-7. Limit for RE02 Narrowband Emissions

90.6 RS03, Radiated susceptibility, electric field.- Over the range of 14 kHz to 18 GHzs, the electric field shall not exceed 1 V/m.

90.7 Powerline EMI reduction requirements.- EMI powerline filters shall be used whenever necessary to eliminate powerline-conducted emissions, in accordance with MIL-STD-461, Part 1, 4.3.1, and conducted susceptiblity. All interconnections between the WMSCR and external systems shall be shielded in accordance with Section 6 of FAA-STD-020. Emphasis shall be placed on equipment interconnection design and layout to reduce undesirable equipment interactions. Equipment that is susceptible to or is a source or radiated EMI shall comply with the requirements above.

90.8 FCC registration.- The WMSCR shall provide the capability of interfacing with common carrier facilities. WMSCR system and CIs interfacing directly with these facilities shall be FCC registered. FCC equipment registration shall be in accordance with 3.3.1.1 of FAA-G-2100.

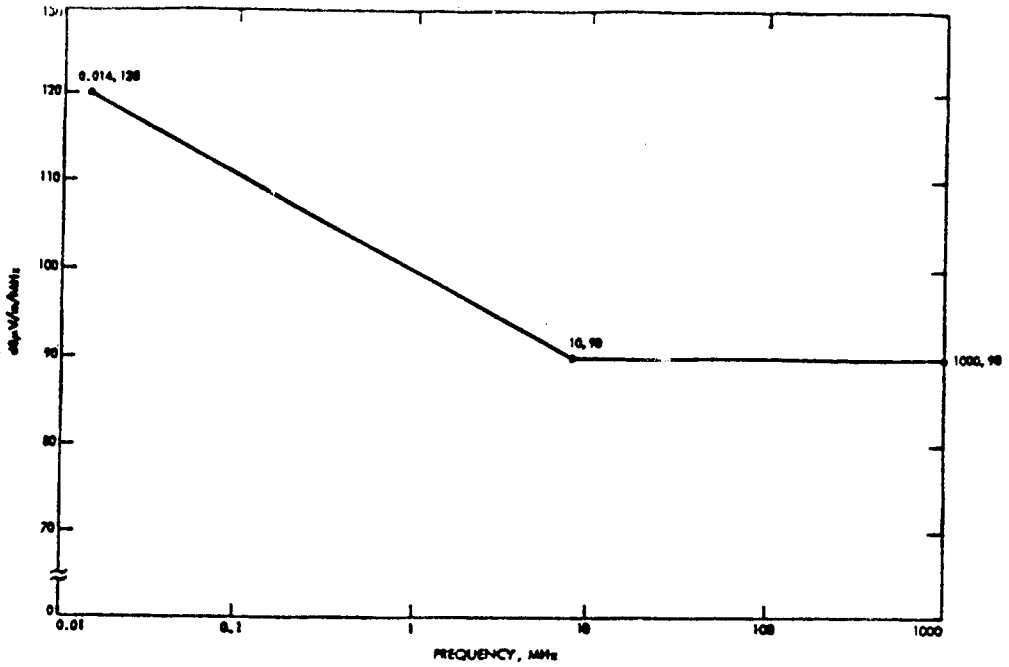

Figure 90-8. Limit for RE02 Broadband Emissions

APPENDIX X

100. NWID SPECIFICATION SUMMARY

The following list summarizes the attributes of the NWSTG WMSCR interface device (NWID).

PHYSICAL LEVEL:

Interface: Synchronous RS-232-C/V.35 (X.21 bis) will operate full duplex, continuous carrier, NWID supplies DTR and RTS, Modem or DSU must supply DCD and CTS.

Transmission:
Rate: Up to 64K, internally or externally clocked.

Number of
Trunks: Four

LINK LEVEL:

Framing: HDLC (as specified in X.25)

Addressing: DTE or DCE (selectable per trunk)

Procedure: LAPB

Parameters: K-1 to 7
N1-2104 (263 Octets)
N2-10
TI-1 to 127 Sec.

Sequence Numbering: Modulo 8

PACKET LEVEL:

Services: PVC

Sequence Numbering: Modulo 8

Logical Channels: 127 per trunk

Routing: Fixed routing (see configuration)

Translation
Features: Call packets:
Prefix deletion
called address translation
calling address removal
Accept packets:
address removal
Clear packets:
address removal
clearing cause shifting

Packet size: up to 256 bytes

Fast select: passed through transparently

GENERAL:

Cabinet Dimensions: For standard 19" racks

NETWORK CONTROL CENTER:

Attributes: Configuration/monitoring from NCC File transfer protocol for sending files between NCC and NWID (Runtime programs, I/O LOGS, etc.)

CONFIGURATION: The NWID will be connected to the NWSTG x.25 HOST, and also connected to 2 remote WMSCR X.25 Nodes.

INBOUND DATA: Inbound data travels from the NWSTG X.25 HOST to the NWID on LCN 1. A copy of this data packet is then sent on LCN 1 on the two remote WMSCR Nodes. Acknowledgment is subject to timeout period, to account for the possibility of dropped data packets due to link level problems.

OUTBOUND DATA: Outbound data travels from WMSCR Nodes on LCN 2 on the X.25 lines. The numbering of the LCN on the line to the NWSTG X.25 HOST is fixed by hardware configuration on the NWID. The NWSTG X.25 line is connected to Port 1 on the NWID, while the two WMSCR Nodes are connected to Port 2 and 3. Outbound data from the WMSCR Node connected to Port 2 on the NWID, travels on LCN 2 on NWSTG Line; data from the other WMSCR Node connected to Port 3 travels on LCN 3.